



Transport
Roads & Maritime
Services

PACIFIC HIGHWAY UPGRADE - TINTENBAR TO EWINGSDALE MODIFICATION TO APPROVAL

St Helena Tunnel Control Centre

APRIL 2013



Contents

1	Introduction.....	1
1.1	Introduction.....	1
1.2	Background.....	3
1.3	Purpose of Environmental Assessment	4
2	Proposed Design refinement.....	4
2.1	Description	4
2.2	Need	6
3	Consultation	6
3.1	Community.....	6
3.2	Government Agencies.....	7
4	Environmental Assessment	8
4.1	Hydrology	8
4.2	Biodiversity	8
4.3	Geology and Soils	12
4.4	Contamination	14
4.5	Hazard and Risk	16
4.6	Traffic, Transportation and Access	18
4.7	Land Use and Property	20
4.8	Noise and Vibration	21
4.9	Aboriginal and non-Aboriginal Heritage	23
4.10	Waste Management.....	24
4.11	Socio-Economic.....	24
4.12	Landscape and Visual Impacts.....	25
4.13	Air Quality.....	32
4.14	Matters of National Environmental Significance.....	33
5	Conclusion	34
6	Bibliography	34

Appendices

Appendix A	TCC Design plans
Appendix B	Community update – construction of the TCC
Appendix C	St Helena Road street meeting notes
Appendix D	Controlled blasting fact sheet
Appendix E	ERG member agency responses
Appendix F	RCA Environmental site investigation report

Document Controls

File name	Status	Issued to	Issued date
Tunnel Control Centre EA Final.doc	Final	DoPI	10/04/2013

I Introduction

I.1 Introduction

The upgrade of the Pacific Highway between Tintenbar and Ewingsdale is part of the Pacific Highway Upgrade Program being implemented by NSW Roads and Maritime Services (RMS). The upgrade is an important part of the Pacific Highway Upgrade Program as on its completion, the Pacific Highway will be dual carriageway from Ballina to the Queensland border. The Program will deliver safer driving conditions and improve the Pacific Highway's capacity to move people and freight between capital cities. The total Project cost is \$862 million and is jointly funded by the NSW State and Federal governments.

The Tintenbar to Ewingsdale project (the approved Project) site is located approximately 10 kilometres to the north of Ballina. The Project involves the construction of approximately 17 kilometres of highway from Ross Lane at Tintenbar and extends north to the existing Ewingsdale interchange, near the settlement of Ewingsdale. At Ross Lane, the upgrade alignment will connect to the northern end of the recently completed Ballina Bypass. Generally the alignment will be in close proximity to the existing highway corridor from Ross Lane to the Bangalow Bypass. The existing highway will be maintained for local and regional traffic. From Bangalow, the upgrade alignment will diverge to the northeast through Tinderbox Valley. From there, the upgrade alignment will avoid the steep grades of St Helena Hill by way of a tunnel approximately 434 metres long and 45 metres below the ridge line. North of the tunnel, the alignment will be located immediately to the east of the existing highway before tying into the Ewingsdale interchange.

Key components of the approved Project include: -

- Four-lane divided carriageways (two lanes each way), with a wide median allowing for the future addition of a third lane in each direction.
- Connection to the northern end of the recently completed Ballina Bypass at the Ross Lane interchange. A new northbound on-ramp and a new southbound off-ramp would be provided. The remainder of this interchange has been constructed as part of the Ballina Bypass project.
- Upgrading of the existing Ewingsdale interchange to provide full access between the modified local and regional road network and the highway.
- A half interchange at Bangalow. South-facing ramps would provide access between the local road network, including to Bangalow and Lismore, and the proposed upgrade to the south. This arrangement would replicate the arrangement with the existing Bangalow Bypass which also has south facing ramps only.
- Six twin bridges and four underpasses allowing roads and creeks to pass underneath the proposed upgrade. These would include twin bridges above Byron, Emigrant and Skinners Creek and the existing Casino-Murwillumbah railway on the northern side of Byron Creek.
- Two bridges carrying local roads over the proposed upgrade, one for Broken Head Road and one about 500 m north of Lawlers Lane providing access to several properties east of the upgrade. Protection screens would be provided on both bridges.
- Twin parallel tunnels under St Helena ridge (one tunnel for each carriageway). The tunnels would each be approximately 434 m long and about 45 m below St Helena Road.
- Retention of the existing highway as a continuous road for local and regional traffic.
- Installation of signage providing clear directions for traffic at the Ross Lane, Bangalow and Ewingsdale interchanges.
- Relocation of a number of public utilities and services.

Figure I provides an overview of the Project location.

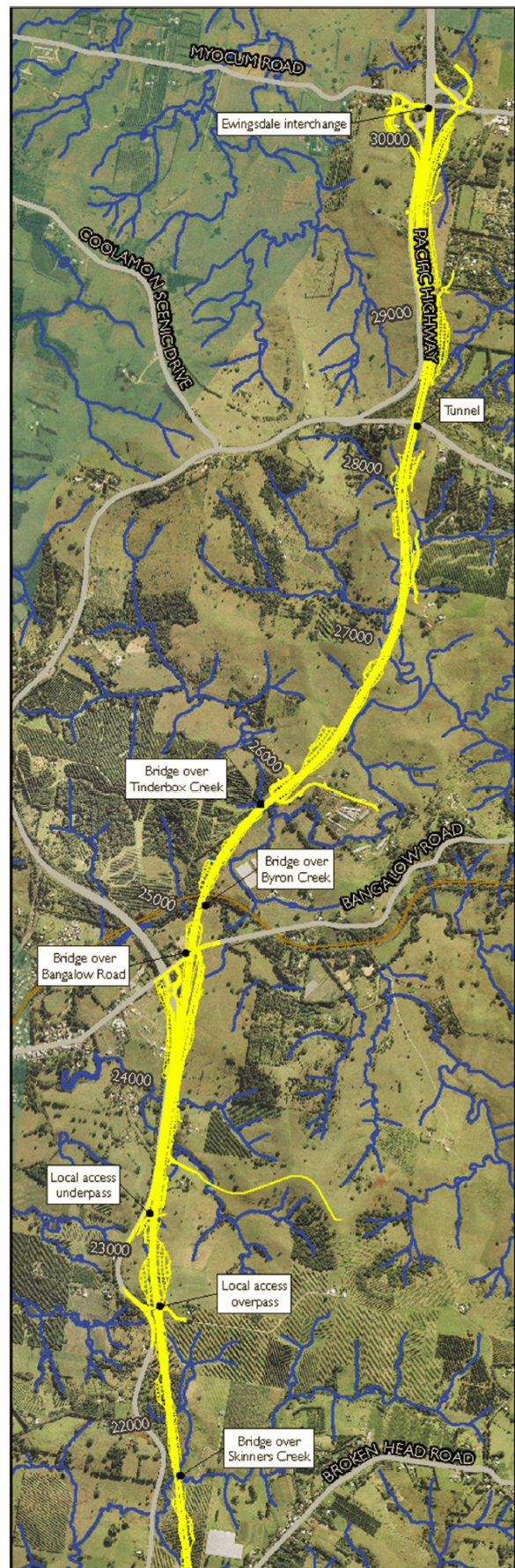
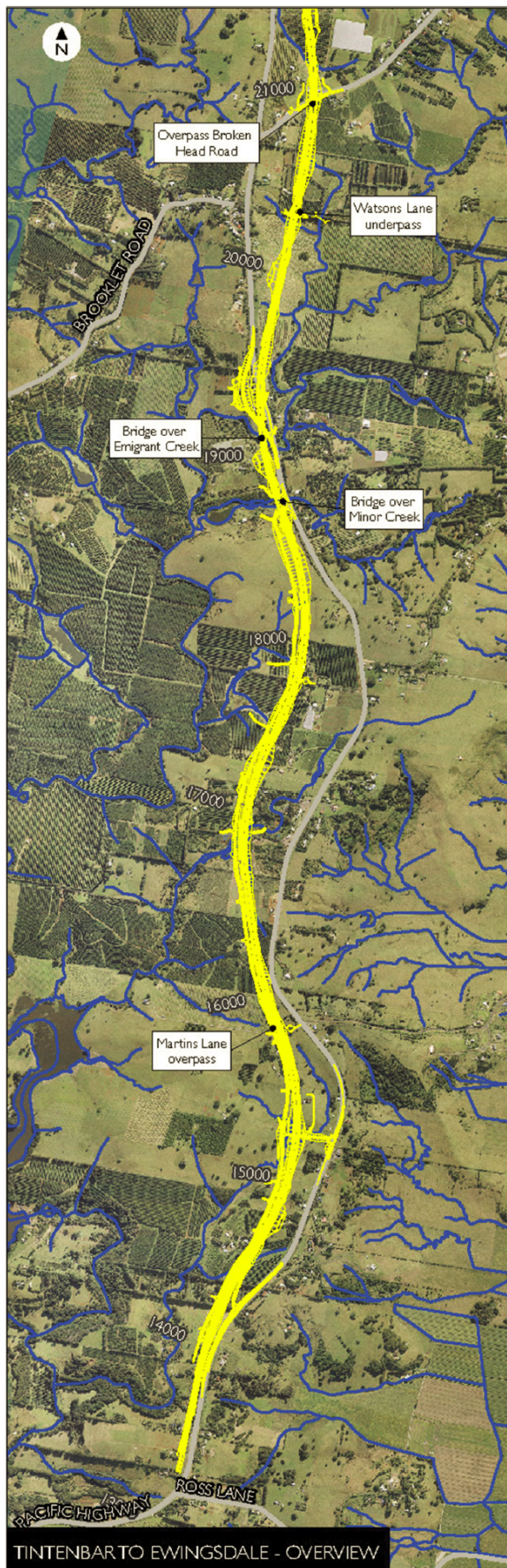


Figure 1 Project Overview

Roads and Maritime Services (RMS) and its contractor Boulderstone Pty Ltd (BPL) have undertaken further design development to the concept design detailed in the project Environmental Assessment. Part of this design development has been focussed on the St Helena Tunnel section of the upgrade, in particular the required operational and emergency management functions. In order to cater for these essential operational requirements of the tunnel a Tunnel Control Centre (TCC) is proposed to be constructed on the St Helena ridge directly above the twin parallel tunnel tubes on land already acquired for the upgrade.

1.2 Background

The former Roads and Traffic Authority (now RMS) completed an environmental assessment of the Tintenbar to Ewingsdale upgrade project (the Project EA) in 2008. The Project EA identified a range of environmental, social and planning issues associated with the construction and operation of the Tintenbar to Ewingsdale upgrade and proposed measures to mitigate or manage those potential impacts.

The Project EA was publicly exhibited for a period of 60 days. Following public exhibition, submissions from stakeholders were received and addressed by RMS in the Submissions Report which was lodged with the Director-General in May 2009.

After consideration of the Project EA and Submissions Report, the Minister for Planning approved the Tintenbar to Ewingsdale Pacific Highway upgrade under part 75J of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) on 29 January 2010¹ subject to the Minister's Conditions of Approval (CoA) being met.

For the purposes of this environmental assessment, the concept design described and assessed in the Project EA and consequently approved by the Minister, is referred to as the Approved Project.

The Minister's approval of the project was given under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). Part 3A of the EP&A Act was repealed on 1 October 2011. Despite this, Part 3A continues to apply to certain projects and concept plans subject to the savings and transitional provisions identified in Schedule 6A to the Act. Schedule 6A (2)(1)(a) states that a project is considered as a transitional Part 3A project if it is an approved project (whether approved before or after the repeal of Part 3A). As project approval was received prior to the repeal of Part 3A, the Tintenbar to Ewingsdale project is considered as a project to which the transitional Part 3A arrangements apply. Any future approvals or modifications would be undertaken in accordance with Part 3A of the Act.

Section 75W of the EP&A Act regulates the modification of a project approval under Part 3A. As detailed above, while Part 3A of the EP&A Act has been repealed, Section 75W still remains valid for projects already determined under this part of the Act. Section 75W determines that Roads and Maritime Services (the Proponent) is not required to obtain the Minister's modification of an approval, if the project as modified would be consistent with the Minister's approval. Project modifications that are deemed to be inconsistent would require a modification to the MCoA under Section 75W (2) of the EP&A Act.

The T2E Project is currently under construction. Construction commenced on 24 September 2012 after the Construction Environmental Management Plan (CEMP) was approved by DoPI on 10 September 2012 and the Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act* 1995 (PoEO Act) was issued on 19 September 2012. The management of environmental impacts associated with construction of the TCC is addressed in the CEMP and the activities associated with both construction and location of the proposed TCC are covered in the EPL. The TCC site falls within the EPL boundary for the Project.

This document forms the modification submission to the Department in accordance with Section 75W (2) of the EP&A Act.

1.3 Purpose of Environmental Assessment

The purpose of this environmental assessment is to: -

- describe the features of the Tunnel Control Centre (TCC);
- assess the potential environmental impacts arising from the construction and operation of the TCC compared to the Approved Project; and
- recommend any additional environmental management and mitigation measures to be undertaken as a result of the construction and operation of the TCC.

2 Proposed Design refinement

2.1 Description

RMS and its contractor BPL have undertaken further design development to the concept design detailed in the project Environmental Assessment. Part of this design development has been focussed on the requirements of the St Helena Tunnel and its elements, in particular the essential operational and emergency management features. In order to cater for these operational requirements of the tunnel, a TCC is proposed to be constructed on the St Helena ridge directly above the twin parallel tunnel tubes.

The TCC includes the following features: -

- a single-storey building that covers approximately 300m² in floor plan;
- direct access from St Helena Road via a one-way internal loop road with secure parking;
- extensive fire and life safety systems, including power, communications, lighting, fire fighting emergency and other safety facilities;
- amenities – kitchen and bathroom;
- subterranean deluge tanks for tunnel fire fighting purposes (containing approximately 2600 kilolitres of water to be used in emergency situations);
- extensive landscaping to both integrate the TCC into the surrounding environment as unobtrusively as possible and complement the wider landscaping plan for the St Helena ridge as part of the Project, in order to re-create as much as possible the lowland rainforest ecological community that once existed within this area;
- concealed security fencing; and
- minor utility adjustments to link into the TCC and tunnel infrastructure.

These features are shown in the TCC concept design plans provided in **Appendix A**.

Given the potential impacts of this structure on the surrounding environment, RMS project specifications provided detailed requirements in relation to the design of the TCC. This included the specific requirements to: -

- Fit in unobtrusively with the topography and natural landscape.
- Not be visible on approach from the main carriageways and from the surrounding areas in terms of short, middle distance and long distance views.
- Minimise the 'footprint' for the tunnel control centre by locating the building, access driveway and hardstand parking areas, over the deluge system / water supply tanks.
- Maintain existing views from St Helena Road and the adjacent residential properties.
- Provide the TCC with landscape screening and mounding, with the deluge system / water supply tanks requiring burial and mounding into the existing ground surface so as to avoid any visual impacts.

Construction of the TCC would require clearing of existing plantation vegetation and excavation to cater for the large deluge tanks that are to be constructed below the existing ground surface, in order to

meet the visual impact and minimal footprint requirements outlined above. No native vegetation would be cleared as part of the works for this Proposal. Similar to the St Helena tunnel tubes, the extent of hard rock at this location means that blasting of rock may be required for the works in addition to rock-breaking.

Utility connections, adjustments and infrastructure are required for the operation of the TCC and to link the TCC with the St Helena Tunnel. Adjustments have been made to the existing services networks (typically along the length of the project and St Helena Road) to provide high and low voltage electricity (Essential Energy), telecommunications (Telstra) and water supply (Rous Water) to both the TCC and the St Helena Tunnel. Typically this work has been placed underground to reduce environmental and visual impacts. In addition, where possible the TCC building has been designed to be energy efficient including the use of solar electric water heating via solar collectors, rain water tanks, and the use of a Byron Shire Council and Department of Health approved aerated waste water treatment system discharged via a sub-surface drip irrigation system within RMS owned land. It should be noted that the majority of utility adjustments required for the T2E upgrade have already been completed. Service connections between the TCC and the St Helena Tunnel would be via an underground combined services trench. Where possible, communication links with the TCC and specialist intelligent transport systems (ITS) and fire and life safety systems would also be by radio link.

The construction methodology for the TCC would generally follow the staging detailed below: -

- installation of temporary erosion, sediment and water quality controls including diversion drainage; sedimentation basins and cross-flow culverts;
- installation of temporary access tracks;
- installation of construction-phase security fencing/screening;
- clearing and grubbing;
- stripping and stockpiling of topsoil and unsuitable material;
- utility adjustments;
- earthworks including drill and blast of hard rock;
- construction of subterranean deluge tanks;
- construction of TCC building
- construction of driveway / access road;
- fencing; and
- landscaping and rehabilitation of site (which would be undertaken progressively where possible).

Once constructed, the area immediately adjacent to the TCC would be appropriately landscaped in accordance with the project Urban design and landscape management plan (UDLMP). This includes planting of specific koala feed tree species as well as rehabilitation with lowland rainforest species to complement the existing stands of rainforest near this location.

The TCC is designed to work automatically and as unstaffed facility. Day to day operation of the St Helena tunnel and the TCC would be remotely monitored / controlled from the Transport for NSW Traffic Control Centre in Redfern and the RMS Northern Region Traffic Management Centre in Grafton. During operation of the tunnel it is anticipated that the TCC would only be staffed during an emergency event or during routine maintenance activities on the St Helena tunnel or the TCC itself, including planned tunnel closures. There would be no permanent staff located at the TCC. Routine maintenance is likely to involve attendance at site approximately every four months. Should there be an emergency in the operational tunnels, emergency personnel would attend the TCC site in order to manage the response to the emergency event. The concept design for the TCC includes two dedicated light vehicle parking spaces and has capacity for additional heavy and light vehicle parking if required, for example in the event of an emergency in the tunnel requiring staffing of the TCC. **Section 4.6** provides additional detail on the proposed parking provisions for light and heavy vehicles and the anticipated numbers of vehicles required to access the site during both routine maintenance and in the event of an emergency. The traffic volumes the site would generate during normal operation are considered to be negligible and less than those associated with the adjacent rural properties.

Refer to Figure 2 for indicative location and layout of the proposed Tunnel Control Centre.

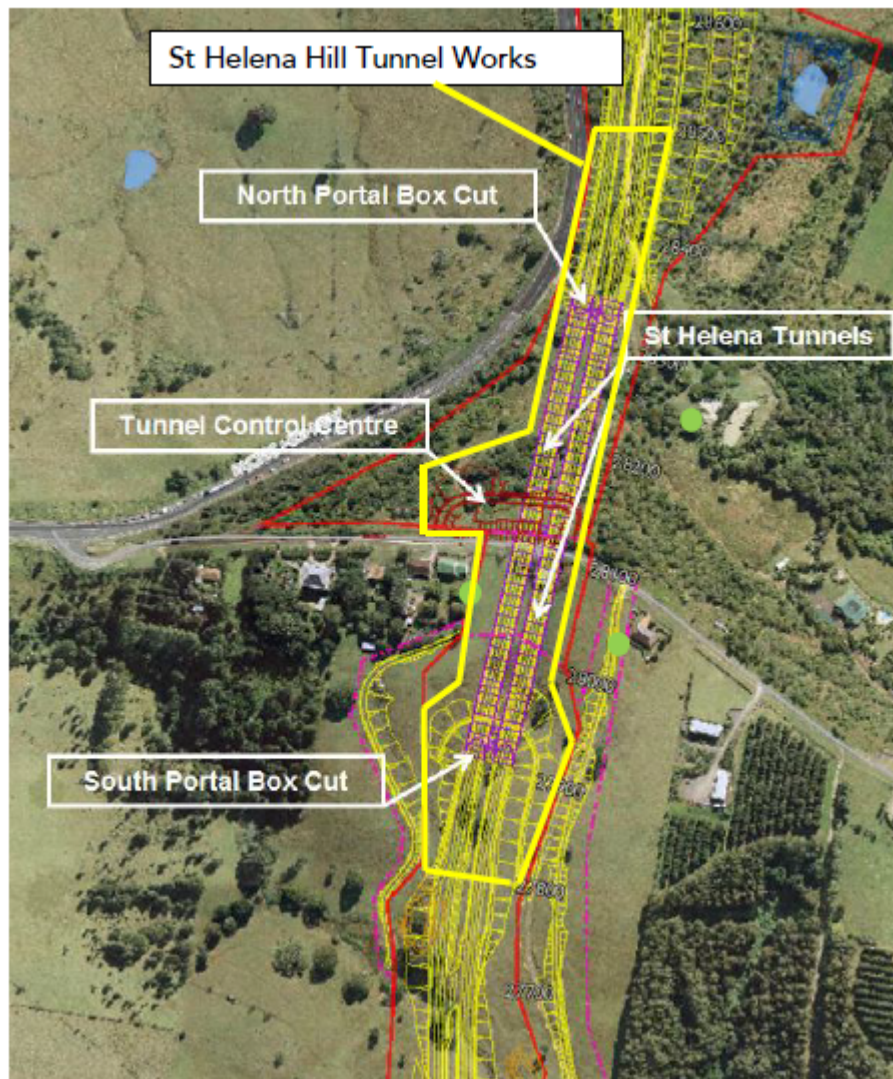


Figure 2 Proposed location of the TCC relative to the St Helena tunnel works

2.2 Need

The TCC is a critical and essential element of the functional aspects of the St Helena tunnel. It provides the associated infrastructure to cater for the stringent workplace health and safety (WHS), fire and life safety systems and emergency communications requirements of RMS and external authorities. All of these requirements cannot be met without the establishment of a TCC. Provision of this facility is consistent with those requirements and with the approach for the management of other major road tunnels in NSW.

3 Consultation

3.1 Community

RMS has undertaken extensive consultation with both the wider community in the vicinity of the T2E Project and also more targeted consultation with nearby residents regarding construction of the St Helena tunnel and the TCC. This is discussed in detail in the *Communications Strategy for Controlled Blasting at St Helena Tunnel and Tunnel Control Centre* which was provided as supporting documentation to the document *Modification Request for an Extension to Blasting Hours, Airblast Overpressure and Vibration Limits*. The request to modify blasting hours, airblast overpressure and

vibration limits for the T2E Project was approved by DoPI on 19 March, 2013. Information regarding the TCC has been provided to the community on a number of occasions at the monthly community information sessions, with the presentations and minutes from each meeting also provided on the Project website at: http://www.rta.nsw.gov.au/roadprojects/projects/pac_hwy/ballina_tweed_heads/tintenbar_ewingsdale/index.html

Works for, or associated with (such as landscaping and urban design), the construction and operation of the St Helena tunnel and the TCC have been discussed regularly at the monthly community information sessions (CIS) for the Project which commenced in January 2012. These works were covered at CIS 1, 2, 3, 4, 5, 6, 8, and 11. In addition a community update on the intended construction of the TCC has been uploaded to the T2E Project website. A copy is provided in **Appendix B**.

In terms of targeted consultation, one on one meetings were held with all affected residents within a 500 metre radius of the St Helena tunnel in April/May 2012. Representatives from BPL and RMS met with residents at each property to provide detailed information about the tunnel construction. The meetings enabled the project team to obtain an understanding of any potential issues or concerns. Follow up meetings and phone calls were made to affected residents after the initial meetings to answer any additional questions. Further consultation was undertaken by way of a street meeting on 21 May 2012 at the property of a St Helena Road resident. The street meeting brought together all residents likely to be affected by the activities associated with the construction of the St Helena tunnel and TCC.

A detailed presentation was given to attendees to ensure each resident was provided with the same information at the same time. The street meeting presentation provided a further opportunity to answer any questions and to explain further detail on the tunnel construction and TCC as per questions or concerns raised in the one on one meeting with residents. The street meeting presentation is included in **Appendix C**. Following this, a controlled blasting fact sheet, letters regarding proposed extended blasting hours, increased vibration and overpressure limits were provided to each resident for their consideration. The controlled blasting fact sheet is provided in **Appendix D**.

3.2 Government Agencies

An environmental review group (ERG) is in place for the Project and has met monthly since February 2012. The ERG is a forum in which members of the Baulderstone project team, RMS, the Project Environmental Representative and relevant environmental agency staff meet to discuss environmental issues associated with the Project. ERG member agencies include: -

- EPA;
- DPI (Fisheries);
- Rous Water;
- NSW Office of Water;
- Ballina Shire Council; and
- Byron Shire Council.

The works for the construction of the TCC were raised in the December 2012 ERG meeting in terms of a look-ahead for works planned in 2013. No questions in relation to the proposed works were raised by agency members during the meeting. ERG members have also been made aware of the proposal to construct the TCC through discussions on, and an opportunity to review and provide comment upon the proposed modification to blasting hours and blasting limits approved by DoPI on 19 March 2013. The only comments received in relation to the proposed modification were from the EPA and comments were restricted to the noise and vibration aspects of the proposed increases in hours and blasting limits.

This environmental assessment for the proposed modification was provided to the relevant ERG member agencies for review on 20 March 2013. The document was sent to EPA, NSW Department of Primary Industries (Fisheries), Rous Water and Byron Shire Council. Responses were received from

each agency stating that they had no comments on the document. The agency responses are provided in **Appendix E**.

4 Environmental Assessment

An assessment of the proposed Tunnel Control Centre (TCC) has been undertaken to compare the environmental impacts of the TCC relative to the environmental impacts of the Approved Project.

Only those impacts which are additional (either positive or negative) as a result of the construction of the TCC are discussed in the following sections. Impacts which are consistent with the Project EA are not discussed. The construction of the TCC has been assessed using the topics/issues discussed in the Project EA.

4.1 Hydrology

Construction impacts

Groundwater at the crest of St Helena Hill has been measured to commence at a depth of approximately 12-13 metres below the natural ground level. Excavations for the deluge tanks would be to a depth of approximately 10 metres below the ground surface, meaning that it is unlikely that groundwater would be encountered or affected by these excavations in this location. In any case, construction would be short term and the tanks are impermeable, therefore no construction impacts on groundwater are anticipated.

Operational impacts

The hydrogeology report prepared for the Project determined that the worst case long term reduction in groundwater recharge to all catchments intersected by the Project is likely to be less than 0.35 per cent of initial conditions which is considered to be relatively insignificant, and overall the decreases in groundwater balances are likely to be less than this as there would be increased run-off to safety features such as operational phase basins, which also provide recharge of regional groundwater (GHD, 2013: 28).

Management and mitigation of impact

It is not expected that there would be any impacts on hydrology during either the construction or operational phase that require mitigation or management.

4.2 Biodiversity

Background

The terrestrial flora and fauna assessment working paper prepared for the Project EA identified the plant community within the area of the TCC as comprising Lowland Rainforest which is listed as an endangered ecological community (EEC) under the *Threatened Species Conservation Act 1995* (Biosis, 2008). However, it was noted in the working paper that: -

The patches of Lowland Rainforest in the study area are considered to be in moderate to poor condition due to the small size and fragmentation of the patches and the resulting altered structure and reduced native species diversity. The patches are highly modified due to the impacts of adjoining land uses though many of the patches show signs of natural resilience (Biosis, 2008: 31)

Rainforest habitats provide a wide range of food and shelter for vertebrate fauna. The lowland rainforest remnants across the T2E project area have been highly disturbed and are restricted to small isolated patches of rainforest remnants which nonetheless provide refuge and other habitat functions for a range of species. During the preparation of the EA for the T2E Project it was assessed that all examples of this habitat in the T2E project area had been previously disturbed and were subject to ongoing direct and indirect disturbance. The rainforest habitat was assessed as having a moderate habitat value based on the ground flora containing a high number of indigenous species; the ground, log and litter layer being largely intact; and a large variety of habitat and resources being available for a range of native fauna.

Examples of threatened fauna that may utilise these habitats include rose-crowned fruit dove *P. regina*, masked owl, grey-headed flying fox and microchiropteran bats.

Between the period in which fieldwork for the EA and terrestrial ecology working paper were undertaken and when the subject land was purchased by RMS, the majority of the remnant rainforest between St Helena Road and the existing Pacific Highway on St Helena ridge was cleared by the then land owner and planted with bananas. This clearing and re-planting resulted in significant disturbance to the ground surface around the location of the TCC. In addition, large sections of the property were used as rubbish dumps (see **Figures 3 and 4** below).



Figure 3 View from track at base of property up toward the crest of St Helena Hill, showing banana plantation and dumped rubbish.



Figure 4 View of rubbish pile and banana plantation at crest of St Helena Hill in approximate location of TCC

Wildlife corridor

A number of wildlife corridors have been identified by the Office of Environment and Heritage (OEH) and Byron Shire Council in the general Byron Bay / Bangalow area (**Figure 5**). The identification of these corridors is based on a regional scale representation of potential habitat and linking habitat for species and species assemblages. One of these corridors crosses the Project along the St Helena ridgeline and connects coastal ecosystems south and west of Byron Bay to upland ecosystems west and northwest of Bangalow. The EA stated: -

The quality and extent of wildlife habitat within this corridor is relatively low and its designation as a wildlife corridor appears to be more related to its future potential with appropriate management, than its current functionality (Arup, 2008: 179).

Byron Shire Council and OEH have records of koalas utilising the general area in the vicinity of St Helena ridge and it is postulated that this species currently makes use of the ridgeline as a crossing point. Koala was listed as Vulnerable under the TSC Act at the time the EA was prepared. The combined koala (*Phascolarctos cinerus*) populations of Qld, NSW and the ACT were listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act* 2001 in 2012, post-approval of the EA. The TSC Act impact assessment prepared as part of the terrestrial flora and fauna assessment undertaken during preparation of the EA assessed the likely impacts on long-term viability and rate of extinction upon koalas in the vicinity of the T2E Project as a whole as: -

The proposed upgrade would involve clearing of potential foraging habitat for the Koala. Potential habitat within the study area is considered to be of moderate to poor quality, and does not meet the criteria to be considered potential Koala habitat as outlined in the Draft Recovery Plan for the Koala. Better quality naturally occurring habitat for this species exists elsewhere in the Locality, particularly in the Moist Sclerophyll Forest closer to the coast.

Indirect impacts to the potential habitat for the species include an increase in existing edge effects. Edge effects are on average likely to extend to approximately 50 m from the edge of a patch of vegetation (Biosis Research, 2000). The patches of vegetation in the study area are already subject to edge effects. The implementation of mitigation measures, such as sedimentation and erosion controls and the Vegetation Management Plan, would minimise indirect impacts.

The proposed upgrade would not remove any potential habitat for the Koala present in the study area. Indirect impacts are not expected. Given the minimal impacts on potential habitat, the proposed upgrade is unlikely to significantly reduce the quality of potential habitat for the Koala within the study area.

Given that potential habitat in the study area is unlikely to be directly impacted, fragmentation is unlikely to increase and mitigation measures would be employed to offset indirect impacts of the proposed upgrade, it is considered unlikely that a viable local population of koalas would be placed at risk of extinction by the proposed upgrade (Biosis Research, 2008:338).



Figure 5 Previously identified wildlife corridors in the vicinity of the Project (from Project EA)

Construction impacts

Impacts upon native flora and fauna as a result of construction of the TCC are expected to be temporary in nature and not in excess of those associated with the Approved Project. As stated previously, the remnant lowland rainforest EEC in the vicinity of the TCC was cleared by the previous landowner between the time in which the EA and specialist studies were prepared and purchase of the land by RMS. RMS has made clearing of the bananas subsequently planted on this land and replanting with lowland rainforest species a requirement of the construction contract for the Project. In addition, the Project Deed requires the Contractor to actively and continuously suppress weeds throughout the entire project site, including the remaining patches of lowland rainforest on this parcel of land (but outside of the footprint of construction works), as these patches are in poor condition due to the growth of weed species such as camphor laurel within these patches. These weed removal and suppression works would serve to keep down invasive species and give the remnant rainforest species an opportunity to re-establish without competition. Thus the combination of the proposed landscaping around the completed TCC, weed removal and suppression works and replanting of lowland rainforest on the remainder of this parcel of land would result in a positive environmental impact and enhance the opportunities for fauna to utilise this area as a corridor for movement across the landscape, as well as attempting to recreate an ecological community which was once widespread in the local area but is now in short supply. Furthermore RMS has worked with OEH to identify opportunities for wildlife passage across the corridor, and the St Helena ridgeline was identified during the detailed design phase of the Project as having the highest potential for fauna passage in the northern end of the Project, with koalas as the particular target species, as there are records of their being seen on land within 100 metres of the proposed works. The lowland rainforest planting mix for this portion of the Project includes koala feed tree species to encourage koalas to utilise the area in the future and the re-planted rainforest itself is expected to provide additional habitat for the species.

Operational impacts

Operational impacts from the construction of the TCC are considered to be minimal or nil and are expected to have a positive effect upon biodiversity within the study area. The construction contract requires all plantation plantings on land purchased by RMS for construction of the project to be removed and replaced with native vegetation. The land on top of St Helena Hill, around the infrastructure for the TCC and down along the western spur of the hill, would be replanted with a mix of species representative of species found within Lowland rainforest EEC. The habitat value of the identified wildlife corridor through this area for flora and fauna species, in particular koalas, would be enhanced by this replanting work. The TCC would be fenced with standard fauna-proof fencing to prevent fauna entrapment and entry into the TCC.

Management and mitigation of impacts

Any impacts on flora and fauna associated with the construction of the TCC would be managed in accordance with the Flora and fauna management sub-plan which forms part of the approved CEMP for the Project. No negative impacts on biodiversity are expected to occur as a result of operation of the TCC.

4.3 Geology and Soils

The approved project EA states the geological materials that make up the TCC site comprise largely basalt rock and soils derived from the basalt. The basalt is known as the Lismore Basalt. It was formed from a series of lava flows from the now extinct Mt Warning volcano about 20 million years ago during the Tertiary Period. The published soil landscape map for the area (Morand, 1994) describes the soil type present at the site of the TCC as susceptible to erosion.

The majority of the excavation for the TCC would take place in high strength basalt (shown in Figure 7 below as Ground Type E). High strength basalts require either controlled blasting or hydraulic hammering to excavate them. In areas where the depth of earthworks is very low, hydraulic rock breakers would likely be used to remove any rock. The reason for this is that at very shallow depths blasting is often impractical and therefore the removal of this material requires hammering. However,

Legend

- Borehole - Proposed
- Borehole - Existing
- Bucket Auger - Proposed
- Test Pit - Proposed
- Test Pit - Existing
- Piezometer (Shard pipe)
- Piezometer (Straining Wire Piezo)
- Piezometer (Discontinued/Destroyed)
- Existing CPT
- RMS - Groundwater Monitoring Boxes
- RMS - Surface Water Monitoring Locations
- OSM - Registered Boxes
- Staff boundary_20120111

Deluge tank area

Approximate fill area

Break of slope

Geotechnical Cross section

Excavation to 126.6m RL

Scale

1:500

PRELIMINARY ONLY

NOT TO BE USED FOR CONSTRUCTION

This map was created on 06/02/2012

Note: The GIS representation included herein includes a compilation of a multitude of design elements from various data sources and files.

This GIS is provided for information only and should not be relied upon for design or construction purposes.

Reference should be made to the latest revision of the relevant design package.

PACIFIC HIGHWAY UPGRADE
TINTNAR TO EWINGSDALE
GIS RENDER 06/02/2012
GEOTECHNICAL LAYOUT PLAN
TUNNEL CONTROL CENTRE

Drawn: TOS, Checked: BLOI, Design Date: DRG, Issue No: 0551, Issue: B

Environmental assessment for modification request, T2E, Tunnel control centre

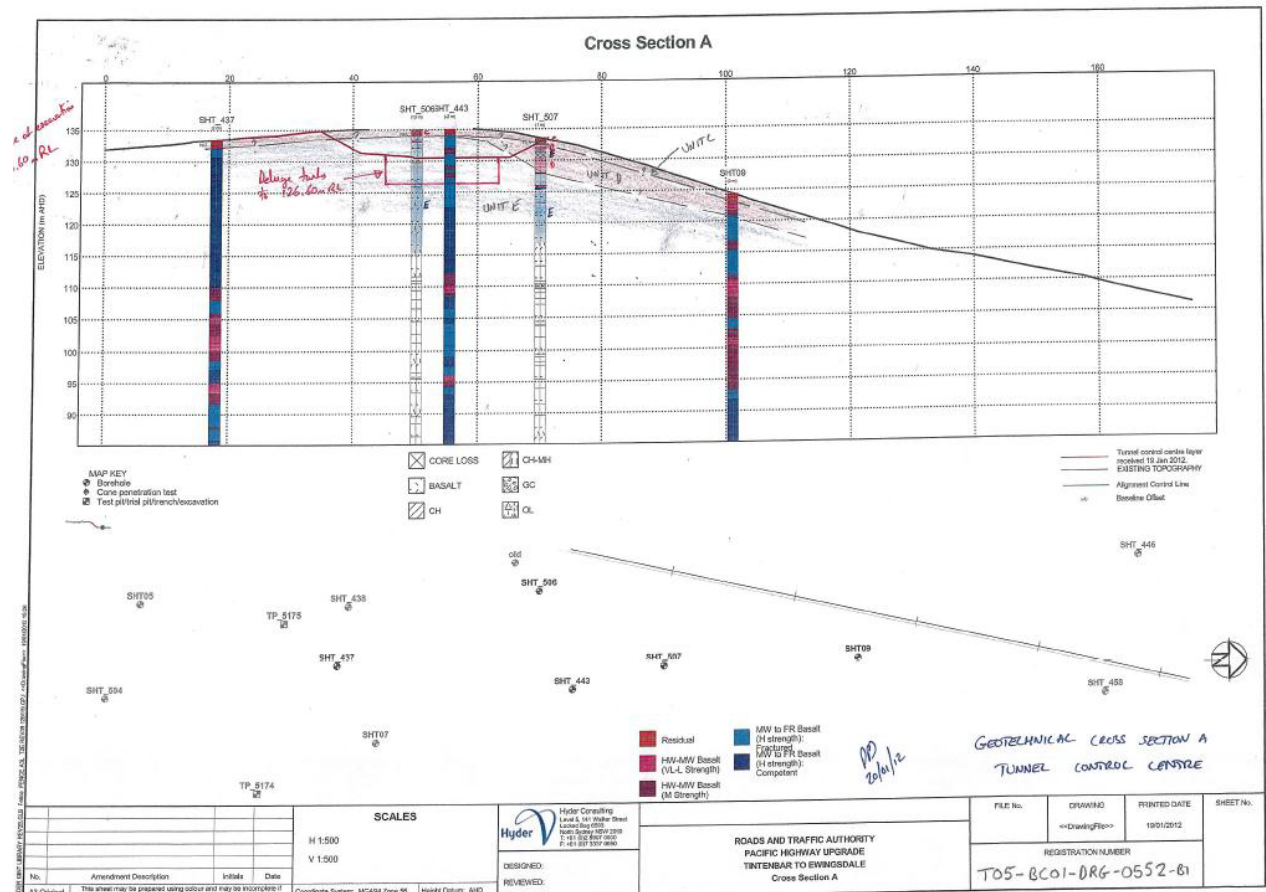


Figure 7 Geological cross section A of TCC excavation

Construction impacts

Construction of the TCC would involve excavation with minimal fill replacement. For this reason the risk of erosion is minimised through the construction methodology. However as for the entire project the approved Soil and Water Management Sub-Plan would be followed with regard to design, monitoring and maintenance of erosion and sedimentation controls.

Operational impacts

The operation of the TCC is not anticipated to have any ongoing impacts upon geology or soils in the vicinity of the works as the works would be progressively stabilised and rehabilitated through re-planting of lowland rainforest species during construction.

Management and mitigation of impacts

Given the current situation of an area on top of St Helena Hill in poor condition following clearing for the planting of banana plants and establishment of informal access tracks through the site by the previous land owner, the proposed works associated with construction of the TCC are anticipated to have a net benefit in terms of the management of soil erosion and soil conditions. Management of impacts associated with rock removal by blasting are addressed in Section 4.5 of this report, whilst management of impacts associated with management of the spoil and rock to be removed by the excavation and blasting proposed at the TCC are addressed in Section 4.10.

4.4 Contamination

The approved Contaminated land management sub-plan (CLMSP) for the Project details previous studies undertaken within the area of the approved Project both during the project EA stage and following Project Approval. The banana plantation between chainage 28100 and 28500 (which includes the location of the proposed TCC) was subject to an environmental site investigation (see **Appendix F**

for a copy of the report) prior to the commencement of construction to determine the levels, if any, of site contaminants within this section of the Project site (RCA, 2011). Assessment of the soil on site followed the *National Environmental Protection Measure (NEPM) for the Assessment of Site Contamination* 1999 guidelines. Schedule B of the NEPM contains guidelines for the assessment of site contamination. The RCA assessment determined that based on the proposed development of the corridor for use as a highway, NEPM Health Based Investigation Level (HIL) 'F' guideline was appropriate for assessment of potential contaminants at this site. HIL 'F' is considered applicable to land that is: -

Commercial/Industrial, no poultry, no fruit or vegetable consumption, no groundwater consumption: includes premises such as shops and offices as well as factories and industrial sites.

In addition to this, the NSW EPA Guidelines for assessing banana plantation sites were used to determine the scope of assessment required at the site. Table B in the guidelines presents criteria for the investigation thresholds for sample results. The criteria provided are: -

- Arsenic – 100mg/kg;
- Lead – 300mg/kg;
- DDT – 50mg/kg; and
- Aldrin/Dieldrin – 10mg/kg

These concentration criteria are equivalent to the HIL 'A' (residential) criteria of the NEPM, a more stringent criteria than that of the HIL 'F' criteria outlined above. RCA stated in its report that the application of threshold criteria in the EPA banana guidelines was unnecessarily stringent given the proposed end land use at this site, as the site would be landscaped and not used for the growth of fruit or vegetables and the TCC can be considered under the HIL 'F' guideline to be an office/industrial site.

The results of soil and groundwater contamination testing at this site are as follows: -

- All arsenic results were within the adjusted HIL 'F' criterion, although eight samples were in excess of the adjusted HIL 'A' criterion.
- Additional analysis of 32 discrete samples from the above eight composites indicated three samples with concentrations in excess of the HIL 'A' criterion. No samples were in excess of the HIL 'F' criterion.
- All lead results were within the adjusted HIL 'F' and HIL 'A' criteria.
- No organochlorine pesticides were detected in any sample (RCA, 2011:4).

In addition, to meeting the HIL 'F' criterion, the level of contaminants at this site also fall within the levels that enable the reuse of materials excavated for the construction of a public road in accordance with the PoEO Act Excavated Public Road Material Exemption (May 2012).

After analysis of the sampling results, RCA's report did not make any other recommendations in relation to the Banana Farm. PSP-ENV-CN-001 (Contaminated Land Management Procedure – CLMP) provides more detail on the process for investigation of sites within the Project known or suspected to contain contaminated soils outlined in the CLMSP. The CLMP outlines in what circumstances a preliminary site investigation (PSI) should be prepared and then whether additional investigation in the form of a detailed site investigation (DSI) is required. The construction outcome for this site is that no further investigation or remediation is required. The soil at this location can be used for the construction of a public road.

Construction impacts

The CLMSP requires that construction activity on land either currently or previously used for macadamia and banana plantations would be undertaken only after the risk of encountering soils containing elevated levels of insecticides and fungicides has been assessed in accordance with PSP-ENV-CN-001 Contaminated Land Management (a procedure under the CLMSP). Former use of the TCC site includes banana cropping therefore the procedures and mitigation measures set out in PSP-ENV-CN-001 would be followed during construction of the TCC. The banana plantation on top of St Helena Hill (including

in the area of the proposed TCC) has already been cleared as it is a requirement of the construction contract that all plantation material be cleared within the Project boundary as soon as possible after commencement of construction to reduce the risk of spread of pests and diseases into adjacent operational plantations. The banana material and associated topsoil from the former plantation at this site have been buried under 600mm of inert fill on the northern side of St Helena Hill within the Project boundary. The remaining soil and rock material to be excavated from the site would be re-used within the road corridor in accordance with the PoEO Act Excavated Public Road Material Exemption (May 2012).

Operational impacts

There are no activities associated with the operation of the proposed TCC that would generate sources of contamination.

Management and mitigation of impacts

Construction-phase contamination impacts associated with the construction of the TCC would be managed in accordance with the CLMSP. No operational-phase impacts would occur as a result of construction or operation of the TCC.

4.5 Hazard and Risk

Construction impacts

Hazards and risks associated with the construction of the TCC relate primarily to the blasting works associated with removal of rock for the construction of the subterranean deluge tanks. Risks associated with blasting include: -

- human injuries/fatalities associated with blasting accidents or use of incorrect blasting techniques generating flyrock outside of the exclusion area;
- damage to property and or livestock from uncontrolled flyrock.
- damage to property associated with excessive blast-related vibration or air-blast overpressure; and
- risks to the wider community of explosives falling into the wrong hands through theft from the worksite or the explosives magazine.

Operational impacts

The operation of the TCC would be largely automatic and would not have any particular risk associated with it.

Management and mitigation of impacts

The NVMSP has been prepared in accordance with Condition 6.5(d) of the Project Instrument of Approval. Pre-construction noise monitoring (attended and non-attended) and modelling has also been completed as part of the development of the NVMSP (refer Appendix A of the NVMSP, Noise and Vibration Impact Assessment (NVIA)). The NVMSP forms part of the overarching Construction Environmental Management Plan (CEMP) and details the mitigation measures and monitoring required during the construction phase to manage potential noise and vibration related impacts associated with the construction of the Project, including construction of the TCC

Mitigation measures relating specifically to blasting for the Project as taken from the NVMSP, RTA D&C G36 and the Project Scope of Works and Technical Criteria relate to the prior identification of sensitive receivers and ensuring appropriate measures are undertaken to ensure airblast overpressure and vibration limits are adhered to. Compliance would be achieved through the implementation of the *Drill and blast (above ground) construction management plan* (CWMS-RW-I8). The plan addresses potential risks and control measures associated with the proposed blasting works, in accordance with Section 4 of *AS 2187.2- 2006 Australian Standard Explosives – Storage and Use, Part 2: Use of Explosives*, and addresses the following issues: -

- MCoA and EPL requirements;
- safety and security;

- consultation requirements;
- physical characteristics and geology;
- responsibilities;
- environmental impacts;
- special precautions; and
- blast design.

Proposed management measures to manage vibration and overpressure levels induced by the blasting works for the TCC include the following: -

- Implementation of the Drill and blast (above ground) construction management plan (CWMS-RW-18) in accordance with AS 2187.2-2006 Australian Standard Explosives –Storage and Use, Part 2: Use of Explosives, to formalise procedures so that blasting activities are undertaken in accordance with each blast design and necessary mitigation measures for a particular blast are put in place.
- Monitoring of airblast overpressure and vibration levels from all blasting activities. These results would be made available online in accordance with the MCoAs and EPL.
- Careful blast design based on results from a trial blast as well as information from subsequent blasts. This would include steps to determine if additional mitigation measures other than those relating to charge weights and blast initiation sequencing are required. These measures include placing additional fill or the use of blast mats if deemed appropriate.
- Formalised post-blast review procedures in accordance with AS 2187.2-2006 Australian standard Explosives – Storage and Use, Part 2: Use of Explosives, to ensure that the design of any subsequent blasts reflects the performance of previous blasting activities.
- Using appropriate explosives such as electronic detonators in areas of particular sensitivity to ensure accurate blast hole initiation sequences. Flashing warning lights will be attached to vibration monitors, triggered by vibrations in excess of the maximum Peak Particle Velocity limit as prescribed by the MCoAs and EPL to provide a “real time” visual warning of vibration exceedances. Additional monitoring would also be undertaken to verify compliance with required vibration and overpressure levels associated with the subject blasting as detailed within this report.

In addition to the above mitigation measures, blasting for the TCC works would be avoided during periods of high winds where it is determined that to proceed may have the potential to result in the blast exceeding in Project overpressure limits or create unreasonable impacts to nearby sensitive receivers. In determining whether it is appropriate to proceed with the blast, the responsible Project Manager or delegate would consider: -

- wind speed;
- wind direction;
- the location of nearby sensitive receivers; and
- blast loading and design.

Where it is determined by the responsible Project Manager or delegate that the blast should not proceed due to high winds and potential for the blast to exceed Project overpressure limits, the process of the consideration of the above factors would be documented and reported to the Department of Planning and Infrastructure as part of the Compliance Tracking Program required under Condition 4.1 of the Instrument of Approval issued for the Project.

Compliance monitoring of blasting activities would be undertaken in accordance with Table 11 of NVMSP. All of the above requirements have been integrated into the NVMSP in order to effectively manage the impacts of blasting on surrounding environs in accordance with Project Approvals and other relevant standards and guidelines.

In accordance with RTA D&C G36, when undertaking blasting, due care will be taken during the activity to prevent damage to heritage items, adjacent public utilities, structures and buildings resulting from

construction vibration and air blast. These requirements have also been integrated into the NVMS. Utilities in the area have been identified and information on acceptable limits for these has been received by the Contractor. These limits are above those proposed for blasting at this location. The same management procedures to ensure compliance to the MCoA at sensitive receivers will be implemented to ensure compliance at services.

Mitigation measures for the community have been established, including the CBCP, developed specifically for the St Helena tunnel and TCC blasting activities. The primary purpose of the plan is to outline the communications activities that will underpin consultation with the residents living within a 500 metre radius of the St Helena tunnel and TCC works, who would be potentially affected by construction works, particularly controlled blasting and vibration.

As part of the plan, a damage claim procedure for the St Helena tunnel works was developed which also applies to the TCC works. Letters including the “letter of non-objection for extension to blasting hours”, and “letter of consent to increase vibration and airblast overpressure limits” for the St Helena tunnel construction were delivered to affected residents, which outlined very detailed information about the proposed modification. A tunnel blasting fact sheet was also delivered to residents describing the process for tunnel construction, controlled blasting, and proposed mitigation measures which ensured all affected residents have been given adequate information regarding the tunnel construction and TCC works prior to commencement of the work. A complaints management procedure was also developed as part of the Community Communications Strategy (CCS) and included in the CBCP, and details the process for handling community complaints. The Project has a dedicated toll free 24/7 contact line available (1800 882 787), for inquiries and complaints and it is provided on all published material sent to the community, on the website, at every community information session, and on Project signage.

Following the trial blast on 19 October 2012, sensitive stakeholders in close proximity to the southern tunnel portal (location of the trial blast) were contacted to ascertain whether they, or their livestock, experienced any effects from the trial blast. All residents advised there were no issues. To minimise risk regarding the unlikely event of potential damage to properties occurring from blasting activities, all properties within a 500 metre radius of the tunnel had detailed property condition reports completed. Further to this, structural assessments were carried out on these properties to assess the structural condition of the property prior to any blasting taking place. An assessment of underground water tanks was also undertaken and a copy of the reports provided to each property owner and the RTA’s Representative, prior to the commencement of construction. In addition, water samples were taken from water tanks prior to blasting to record the quality of the water within 500 metres of the blast zone. These results have been provided to each property owner.

Security issues associated with the storage of explosives and their transport to the worksite for construction of the TCC have been addressed in the document *Ancillary Facilities Assessment: Tintenbar to Ewingsdale Pacific Highway upgrade – Minor Creek and Southern Portal Compounds* approved by DoPI on 25 January 2013.

4.6 Traffic, Transportation and Access

There is some potential for delays to residents travelling along St Helena and the Pacific Highway adjacent to St Helena Hill road during the construction phase due to haulage of excavated material and deliveries of plant and equipment, although any additional traffic over and above that already occurring for the Approved Project is expected to be minimal. The majority of material to be hauled from the site would be excavated rock, and would be hauled southwards directly across St Helena Road under traffic control for either placement in the works or further processing such as crushing for re-use. It is not possible to accurately predict at this stage the frequency and numbers of construction vehicles that would use this route. Suffice to say the quantity of material to be removed is relatively small (see **Section 4.10** below) and the haul distance very short, with the resultant number of trucks required being very small. It is likely that a maximum of four trucks on a 10 minute cycle time each would be utilised whilst excavation was occurring (i.e. not all the time). Any movement of materials from the TCC site would be

undertaken simultaneously with the other construction activities being undertaken as part of the upgrade.

Traffic management in relation to these works would be undertaken in accordance with the Construction traffic management and safety plan under the approved CEMP for the Project. Blasting of rock for the deluge tanks may require some stoppages of traffic along St Helena Road, but these would be of short duration and occur only periodically over a period of approximately six weeks.

Road user delay requirements in place for the Project in relation to the Pacific Highway stipulate that when undertaking the works, the free flow of traffic is not delayed in any direction: -

- At any single road occupancy for a duration of longer than five minutes; and
- Cumulatively due to all road occupancies between the Ross Lane Interchange and the Ewingsdale Interchange for a duration of longer than seven minutes.

In addition to these travel time delay requirements, traffic queues caused by road occupancies, measured in any direction, must not exceed 250 m in length. If traffic queues reach 250 m in length, the cause of the delay must be removed until the flow of traffic returns to free flow conditions.

Any blasting activities associated with construction of the TCC that would result in traffic impacts such as traffic stoppages or speed limit reductions would be managed in accordance with an activity-specific traffic management plan which would determine the maximum stoppage time allowable and the time of day with least traffic volumes on the highway. A consistent time of day would be used for blasting where possible to enable road users and the local community to become familiar with the blasting regime for the works so that they have an opportunity to adjust their travel patterns to avoid delays. The days and time of any proposed traffic stoppages would be notified to the community as per the approved Community communications sub-plan under the CEMP, including letter box drops and variable message signs (VMS).

Access to the TCC site during construction would be via St Helena Road. Access would not be required to or across any privately owned land or any land outside that already being utilised for construction of the Project.

Operation

Access to the TCC during operation would be via St Helena Road. The design of the TCC is such that access and egress from the site are separated to enable better access and minimise turning movements (See **Figure 13** in Section 4.12 below and also concept design plans in **Appendix A**). The TCC design has provision for two dedicated light vehicle parking spaces in the south-west corner of the TCC site compound which are intended primarily for use during routine maintenance, (see site compound layout plan in **Appendix A**). There is also a large open hardstand area immediately to the north of these parking spaces to accommodate the turning circle of a standard single unit fire truck in the event of an emergency (see below) or a safety drill, but which also would provide access, parking and room for manoeuvring trucks for any deliveries required during operation, such as when components of the TCC operating system require replacement or upgrading. It should be noted that during planned maintenance activities for the tunnel, the majority of personnel and vehicles and equipment required for the works will be located within the tunnel itself or on the roadway immediately outside. The TCC would only be used to test operate the tunnel fire and life safety systems where this cannot be performed manually from within the tunnel.

In the unlikely event of a significant emergency within the St Helena tunnel requiring activation and staffing of the TCC, it is anticipated the TCC would primarily be accessed by light vehicles conveying personnel required to operate the fire and life safety systems and/or coordinate an emergency response. Emergency personnel would likely be a mix of Fire and Rescue NSW (FRNSW), RMS and NSW Police. However, the TCC has been designed to also accommodate a standard single unit fire truck should it be required to deliver emergency personnel to the facility or to fight a fire at the TCC itself. In the event of an emergency (or other event requiring the TCC to be staffed) once the two dedicated light vehicle parking spaces had been utilised, any additional light vehicles would park along the side of the access

through the TCC. Whilst it is not possible to reliably estimate the precise numbers of light and heavy vehicles required to attend the TCC in the event of an emergency, it is expected that no more than five light vehicles and potentially a FRNSW fire fighting unit would arrive at the TCC or be there at the same time. It is also noted that as the St Helena tunnel will be remotely monitored, the operator monitoring the CCTVs would assist in the best direction/deployment of emergency response resources/units. Furthermore, in the event of an emergency in the St Helena tunnel, the TCC would be the point whereby the emergency response is coordinated, with the majority of emergency personnel being located on the roadway undertaking tasks there.

Management and mitigation of impacts

Potential traffic impacts associated with the construction of the TCC would be minor and short term in nature and would be managed in accordance with the approved Construction traffic management and safety plan for the Project.

4.7 Land Use and Property

The proposed Tunnel Control Centre would be located at Property ID 369 Lot 28 DP 1069577 adjacent to St Helena Road which was purchased by RMS for the construction of the Project. Access to this property would be directly off St Helena Road.

Construction impacts

During construction the potential impacts of the TCC are mainly related to potential impacts upon adjacent land owners. Access to private properties would be maintained at all times.

Operational impacts

During operation, the use of land at Lot 28 DP 1069577 would not result in any additional property impacts to those of the approved project. This property was acquired during the acquisition phase of the project and would be gazetted as the road reserve in future. The property acquisition boundary can be seen in **Figure 6** below. The proposed passive land use for the TCC is entirely consistent with the current rural land use.

Management and mitigation of impacts

It is not expected that there would be any particular impacts on land use or property during either the construction or operational phase that require mitigation or management.

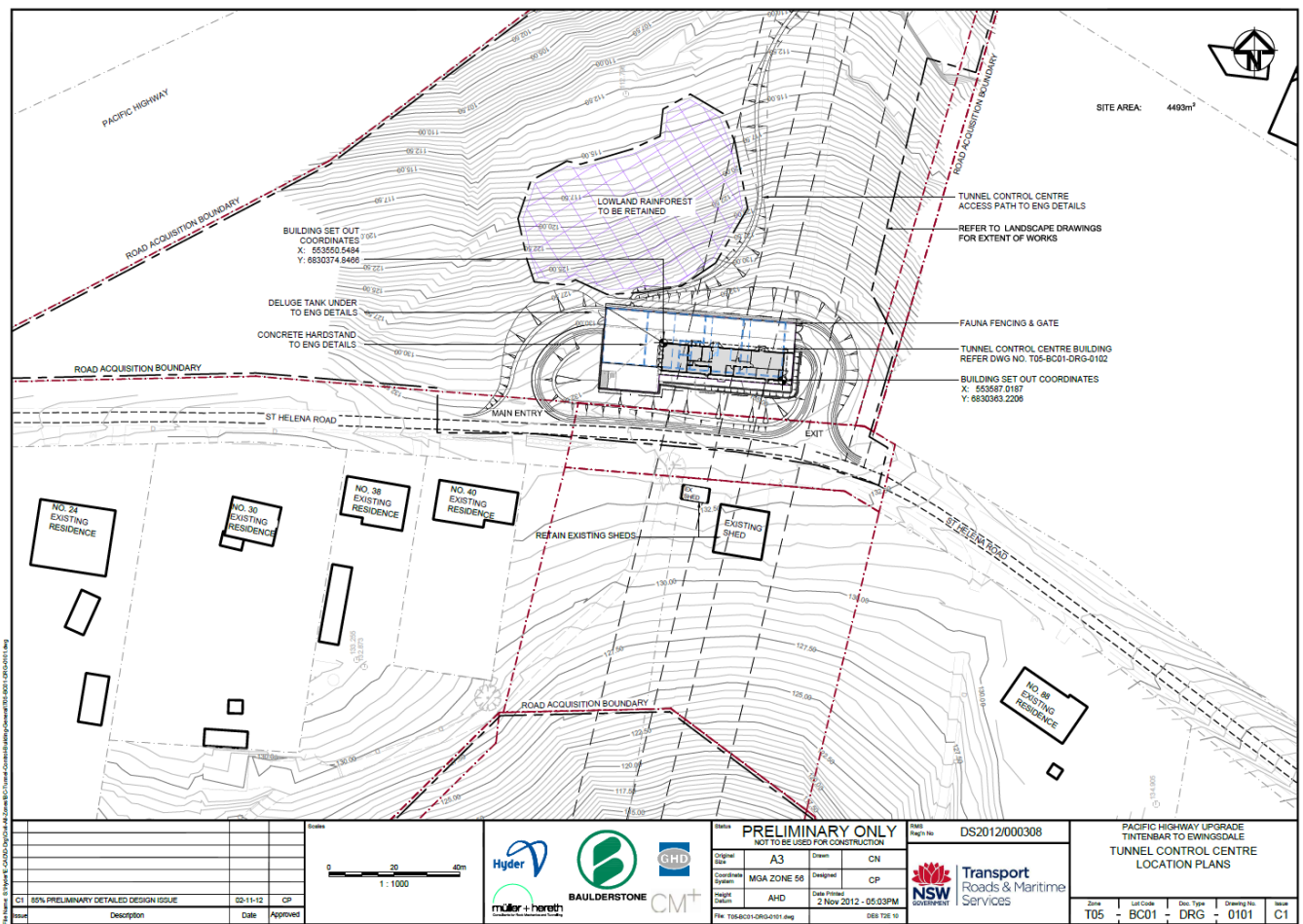


Figure 6 Property acquisition boundary for Lot 28 DP 1069577 showing location of TCC

4.8 Noise and Vibration

The construction of the TCC would require the excavation of approximately 16,500 m³ of earth and rock (of which approximately 12,000 m³ would be blasted rock) in order to house the deluge tanks for the highway tunnels. Investigations into mechanical rock breakage indicated that full mechanical excavation alone is impractical from both a timing perspective and an environmental perspective. As such, it is proposed that rock would generally be broken using controlled blasting methods. Equipment proposed for construction of the TCC includes: -

- 35t excavator with bucket and rock hammer;
- drilling rigs;
- dump trucks;
- TCC Construction delivery trucks;
- concrete pumps;
- diesel generators/compressors;
- needle vibrators;
- cranes;
- hand tools; and
- concrete agitators.

The closest residents to the TCC as identified in the Noise and vibration management sub-plan (NVMSMP) under the approved CEMP are 1158-H01 and 1120-H01, both located approximately 45m from the proposed TCC works. The approval by DoPI on 19 March 2013 of the document *Modification Request for an Extension to Blasting Hours, Airblast Overpressure and Vibration Limits* resulted in the modification of MCoA 2.18 resulting in a change in the Peak Particle Velocity Criteria inclusive for the St

Helena hill tunnel works between chainage 27800 and chainage 28500 where consent has been granted by the owner/occupier that the subject limits may apply to the following as listed in **Table 1** below

Peak Particle Velocity Criteria (mms ⁻¹)	Allowable exceedances
15	5 per cent of a total blasts over a 12 month period
20	Never

Table 1: Peak particle velocity criteria now allowable under MCoA 2.18

Blasting vibration contours modelled as a result of blasting under a 15mm/s blasting scenario are shown in **Figure 7** below.

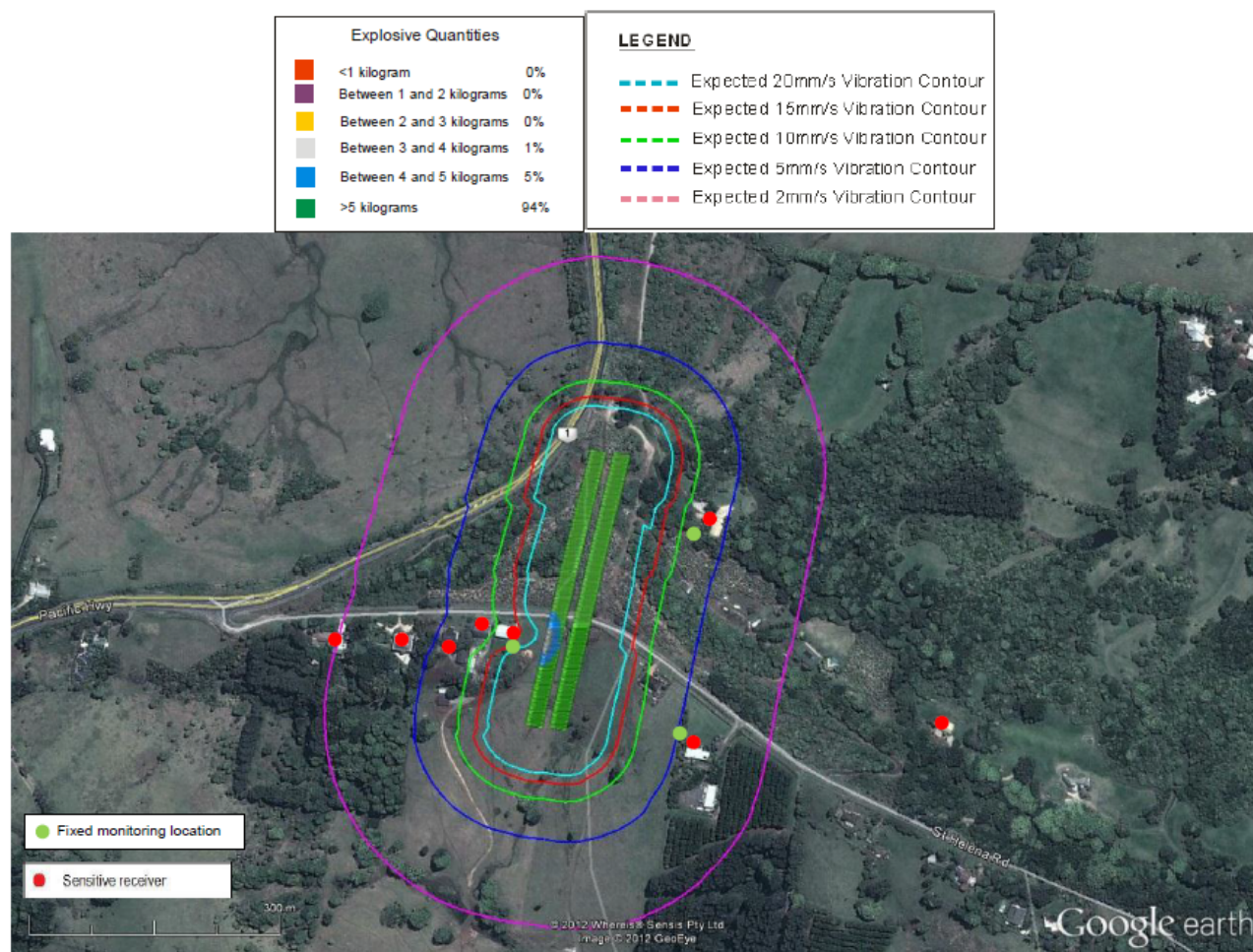


Figure 7 Blast impact zone to 15 mm/s

Construction Noise Impacts

Noise generating activities associated with construction of the TCC would include earthworks, rock hammering and blasting for installation of the water tanks for the tunnel deluge system and drainage works. These activities are detailed in the NVMS and are listed as Type 1, 2 and 3 noise generating activities. Both excavation for the deluge tanks and TCC building construction are detailed as likely to exceed the ICNG levels for construction. None of the TCC activities have been modelled as exceeding the 75dB(A) highly affected noise level.

Ground vibration from blasting during construction

No residential receivers are expected to exceed the building damage criteria for ground vibration during construction of the TCC. Appendix H of the T2E Noise and Vibration Impact Assessment (which forms part of the NVMS) details the contours for ground vibration.

Overpressure from blasting during construction

The proposed drilling and blasting practices for the TCC would be undertaken in a manner so as to ensure neighbouring residents are not exposed to levels of overpressure above the approved project criteria. Whilst it is expected that overpressure from blasting would comply with 115dB(L at 45 metres (distance to the nearest property), a modification to the MCoA for blasting limits for both the St Helena tunnels and the TCC has been submitted to and approved by DoPI, with the aim of the modification being to reduce excavation duration and overall impact on adjacent residents.

Operational noise

The TCC would generate a negligible level of operational noise, as the majority of functions are automatic and contained within a building. The TCC would only be staffed when planned maintenance and inspection work is undertaken, approximately every 4 months, and in the event of a significant incident in the tunnel. Noise would be restricted to vehicles entering and leaving the car park and would be consistent with current levels for usage along St Helena Road.

Section 2.1 of the NSW Industrial Noise Policy (EPA 1999) details that noise impact from an industrial source must not be greater than 5dB(A) above background. Table 4 of the project Noise and Vibration Management Sub-Plan details background (LA₉₀) at the nearest receiver (location 4) to the TCC to be:

- Day 49 dB(A);
- Evening 46 dB(A); and
- Night 35 dB(A)

Given the limited noise emissions predicted from the TCC the risk of exceeding the 5 dB(A) above background is low. If post construction monitoring details levels above this limit additional mitigation measures would be implemented to ensure compliance with the NSW Industrial Noise Policy.

Operational vibration

Operation of the TCC would not include any activities that are expected to have a vibration impact upon the surrounding environment or adjacent receivers.

Management and mitigation of impacts

Noise and vibration impacts would be managed in accordance with the NVMSP.

4.9 Aboriginal and non-Aboriginal Heritage

The location of the TCC falls within the area assessed under the cultural heritage working paper prepared by Navin Officer Heritage Consultants (NOHC) as part of the Environmental Assessment for the Project (NOHC, 2008), and falls within the area of the approved Project. The predictive model of Aboriginal site location did not identify the location of the TCC as an area likely to contain Aboriginal objects or places, given the steepness of the surrounding terrain and the distance of the site from resource zones such as watercourses. The working paper did not consider this location as having a high potential to contain non-Aboriginal heritage sites, with the steepness of the surrounding terrain, particularly to the north, a major constraint. Furthermore, at the time the cultural heritage assessment was undertaken, the land within this section of the study area was covered with old growth lowland rainforest, thought to be a relic of the "big scrub" rainforest which covered the majority of the Lismore to Byron Bay area prior to white settlement. Between the period in which fieldwork for the EA and heritage working paper were undertaken and the subject land was purchased by RMS, the majority of the remnant rainforest between St Helena Road and the existing Pacific Highway was cleared by the then land owner and planted with bananas. This clearing and re-planting resulted in significant disturbance to the ground surface around the location of the TCC (see **Figures 3 and 4**).

Construction impacts

No known Aboriginal or non-Aboriginal heritage sites or places are located within the vicinity of the TCC.

Operational impacts

There would be no impacts on Aboriginal or non-Aboriginal heritage items, sites or places as a result of the operation of the TCC.

Management and mitigation of impacts

Should any items of Aboriginal or non-Aboriginal heritage be uncovered during construction of the TCC, the procedures relating to the discovery of unexpected heritage finds contained within the Heritage management sub-plan of the Project CEMP would be followed.

4.10 Waste Management

Construction

Excavation, blasting and rock removal works for the TCC and deluge tanks would require the removal of non-native vegetation, approximately 4,500m³ of earth and weathered rock and approximately 12,000m³ of rock. The proposed works would not require the removal of any native vegetation.

The amount of vegetation to be removed is unchanged from that required for the construction of the approved Project, as the Deed requires the Contractor to remove all plantation and weed material within the Project boundary and re-plant with native species. The amount of earth and rock that would be generated would be negligible compared to that generated by construction of the remainder of the approved Project and would be re-used in the project. The earth removed from the site would be re-used within the road boundary as fill material (see **Section 4.4** above), whilst the rock would be taken to another point on the Project alignment (most likely adjacent to the southern tunnel portals) and crushed for use in road construction. Other wastes generated during the construction of the TCC are expected to include concrete and excess building materials associated with the construction and fit-out of the TCC.

Operation

Waste generated during operation of the TCC would be minimal and mostly limited to kitchen waste generated during periodic occupation of the TCC for routine inspection and maintenance visits and during any incident in the tunnel that requires the TCC to be staffed. Waste would be disposed of the local council waste facility.

Management and mitigation of impacts

Waste generation and disposal during construction of the TCC would be managed in accordance with the Waste reuse and recycling management sub-plan under the approved CEMP for the Project, which adopts the principles of the *Waste Avoidance and Resource Recovery Act 2001*, including the waste hierarchy of avoid, reduce, recycle and dispose.

4.11 Socio-Economic

The construction and operation of the TCC is anticipated to have a negligible socio-economic impact upon local residents and the surrounding region. Construction is proposed to occur concurrently with the construction of the T2E project and is not expected to generate employment levels above those already in place on the Project. There is some potential for delays to residents travelling along St Helena road during the construction phase due to deliveries of plant and equipment, although this is consistent with that for the rest of the Project.

There are not anticipated to be any negative socio-economic impacts associated with the operation of the TCC due to it being largely automated. Positive impacts associated with the operation of the TCC relate primarily to the speed and efficiency with which it would allow management of a major incident within the tunnel to occur.

4.12 Landscape and Visual Impacts

The Project Environmental Assessment (EA) – Section 5.1, stated that the objective of the concept design was to provide a sound and clear basis for the later development of detailed designs to the standard required to support the construction contract. In addition Statement of Commitment – VI details the commitment from RMS to – integrate the proposed upgrade into the surrounding landscape, minimise impacts from sensitive viewpoints, and maximise the quality of vehicle user experience.

A series of design principles for the TCC were detailed in the Project EA and the RMS project specifications. These design principles were developed to ensure that further development of the concept design was undertaken in accordance with the following principles: -

- design in accordance with RMS Pacific Highway Urban Design Framework (2005);
- fit in unobtrusively with the topography and natural landscape on approach from the Main Carriageways and from the surrounding areas in terms of short, middle distance and long distance views; and
- to minimise the 'footprint' for the tunnel control centre by locating the building, access driveway and hardstand parking areas, over the deluge system / water supply tanks.

During the public exhibition process for the EA a number of submissions raised concerns regarding the visual impact of the project, in particular the tunnel at St Helena Hill. Many submissions stated that the landscape in which the project is situated is predominately rural and specifically requested that the visual impact of the proposal be softened through the use of plantings and vegetation.

The project conditions of approval also include the requirement to prepare an Urban Design and Landscape Management Plan that specifically addresses the design of the tunnel and approaches and plantings.

The Project Deed was also written with strict requirements for the urban design and visual impact of the TCC. Appendix 15 (Urban design performance and design criteria) of the Scope of Works and Technical Criteria within the Project Deed contains the following requirements: -

The tunnel control centre must: -

- (i) be of a high quality urban design architecture which minimises its environmental and visual impact from all views and fit unobtrusively into the highly scenic landscape setting;
- (ii) be recessive, dark in colour and insulated;
- (iii) be provided with landscape screening and mounding. The deluge system / water supply tanks must be buried and moulded into the existing ground surface so as to avoid any visual impacts;
- (iv) be modelled and designed to ensure that it would not be seen from regional, middle or local views. Security fencing and lockable gates around the tunnel control centre must be concealed in the landscape without compromising the security provided by the fence. The tunnel control centre and the deluge system / water supply tanks must be designed:
 - A. for the tunnel control centre to be cut into a small escarpment spur extending north from the St Helena ridge and located directly over the top of the northbound and southbound tunnel alignments clear of the views from the adjacent residential properties on the opposite side of St Helena Road;
 - B. to align the tunnel control centre to lie parallel to the existing contours of the St Helena ridge line;
 - C. to provide a separate access and egress to and from the tunnel control centre (i.e., a drive in and drive out access arrangement from the tunnel control centre onto St Helena Road) suitable for maintenance and service vehicles and FRNSW vehicles including a design single unit vehicle as per section 1.6.2 if the RTA Road Design Guide;

- D. with the tunnel control centre located close to St Helena Road with its southern most wall being located in a cut and a maximum of 15m from the road reserve boundary on St Helena Road;
- E. with the roof line of the tunnel control centre and water tanks and the tops of any other associated infrastructure, including the deluge system / water supply tanks located below the natural surface level of the existing landform and the level of St Helena Road;
- F. with the deluge system / water supply tanks buried and backfilled with sufficient cover and provided with topsoil and landscaping where not located below other infrastructure which would prevent this;
- G. to minimise the 'footprint' for the tunnel control centre by locating the building, access driveway and hardstand parking areas, over the deluge system / water supply tanks;
- H. to minimising the cut and fill requirements and maintaining a natural profile;
- I. to maintain existing views from St Helena Road and the adjacent residential properties;
- J. with the selective use of landscaped earth mounds to screen the tunnel control centre, the access driveways and security fence and which fit in naturally and unobtrusively with the topography and natural landscape of the ridge line in terms of short, middle distance and long distance views;
- K. to maintain the existing stand of remnant threatened Lowland Rainforest; and
- L. to maintain and maximise space for natural fauna passage along the St Helena ridge line.

The Urban design and landscape management plan (UDLMP) for the project describes the how the design of the TCC has been developed to minimise its visual impact as thus: -

The TCC and compound will be cut into the escarpment, with its roof below natural ground level... the deluge tanks associated with the tunnel fire suppression system will be located underground. The compound will be fenced with fauna fencing, as the facility would be located in the escarpment wildlife corridor. The entire TCC will be screened with low shrubs and grasses to maintain views from neighbouring properties to Cape Byron. The existing banana plantation in this location will be removed, the site remediated and planted with selected lowland rainforest species, with trees on the lower slopes to allow existing views to Cape Byron from residential properties to be maintained. The existing stand of trees on the lower slopes will be protected. Considerable design and construction effort has been employed to enable the TCC to minimise its impacts on the environment and the local community (Conybeare Morrison and Context: vii).

Additionally, the TCC compound would be provided with landscape mounding and landscaping in selected locations to ensure that the structure is not seen from regional, middle or local views. Fauna exclusion and security fencing and security gates would be concealed in the landscape (Conybeare Morrison and Context: 102).

Figures 8 to 10 below show the banana plantation and ground disturbance in place at this location when RMS purchased the land.



Figure 8 View from St Helena road north over the location of the TCC, showing the banana plantation and how land drops away steeply to the north



Figure 9 View from within proposed TCC site looking toward property at 40 St Helena Road



Figure 10 View from within the proposed TCC site looking north east toward the coast. Note pile of demolition rubbish in foreground

Figure 11 below shows the planting and landscaping regime proposed at this location, whilst **Figure 12** is a series of elevations of the TCC showing how the building is recessed within the landscape and how the visual impact of the deluge tanks is eliminated by housing them beneath the TCC structure.

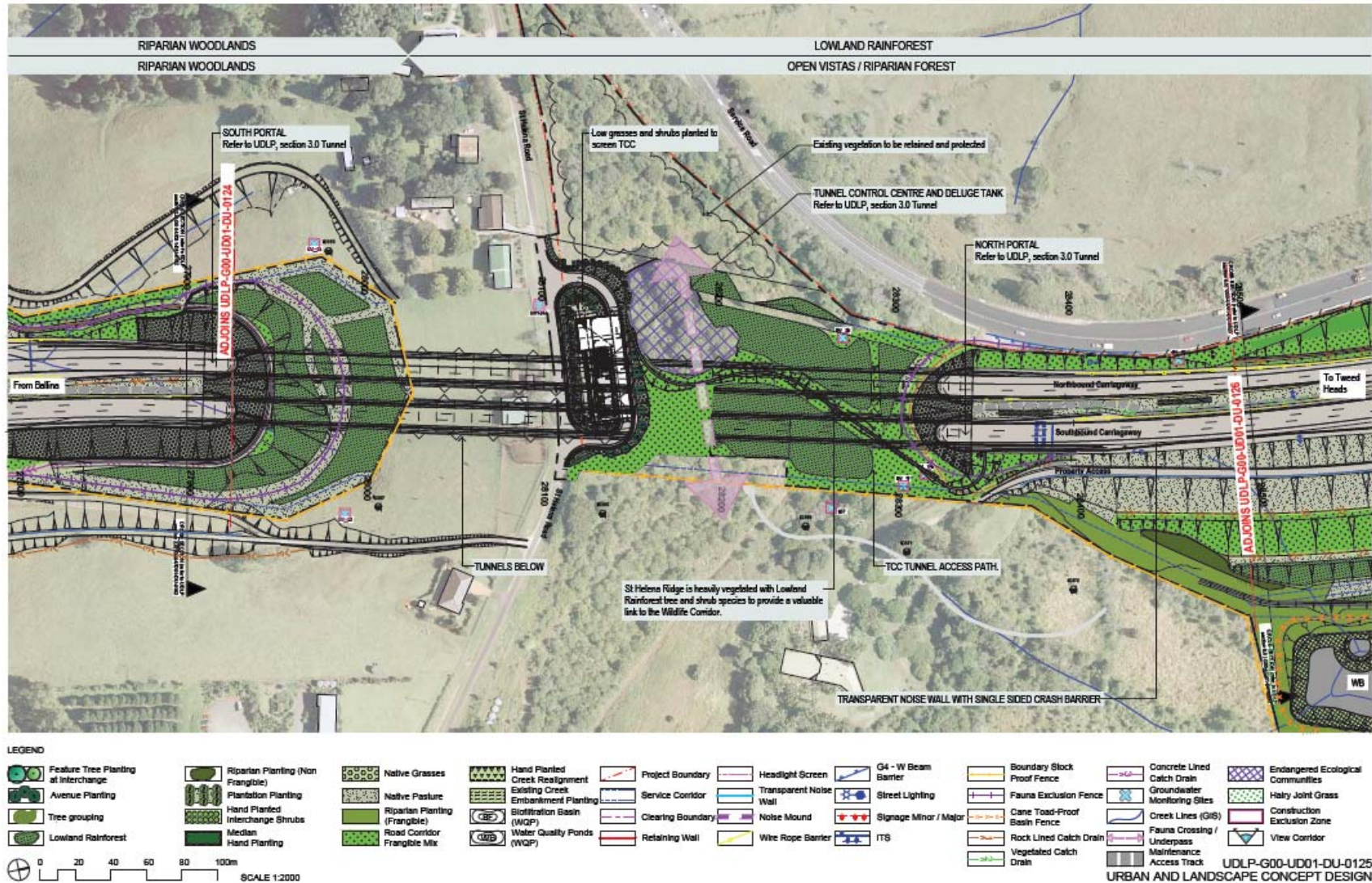


Figure 11 Landscaping context for area around St Helena tunnels (from UDLMP)

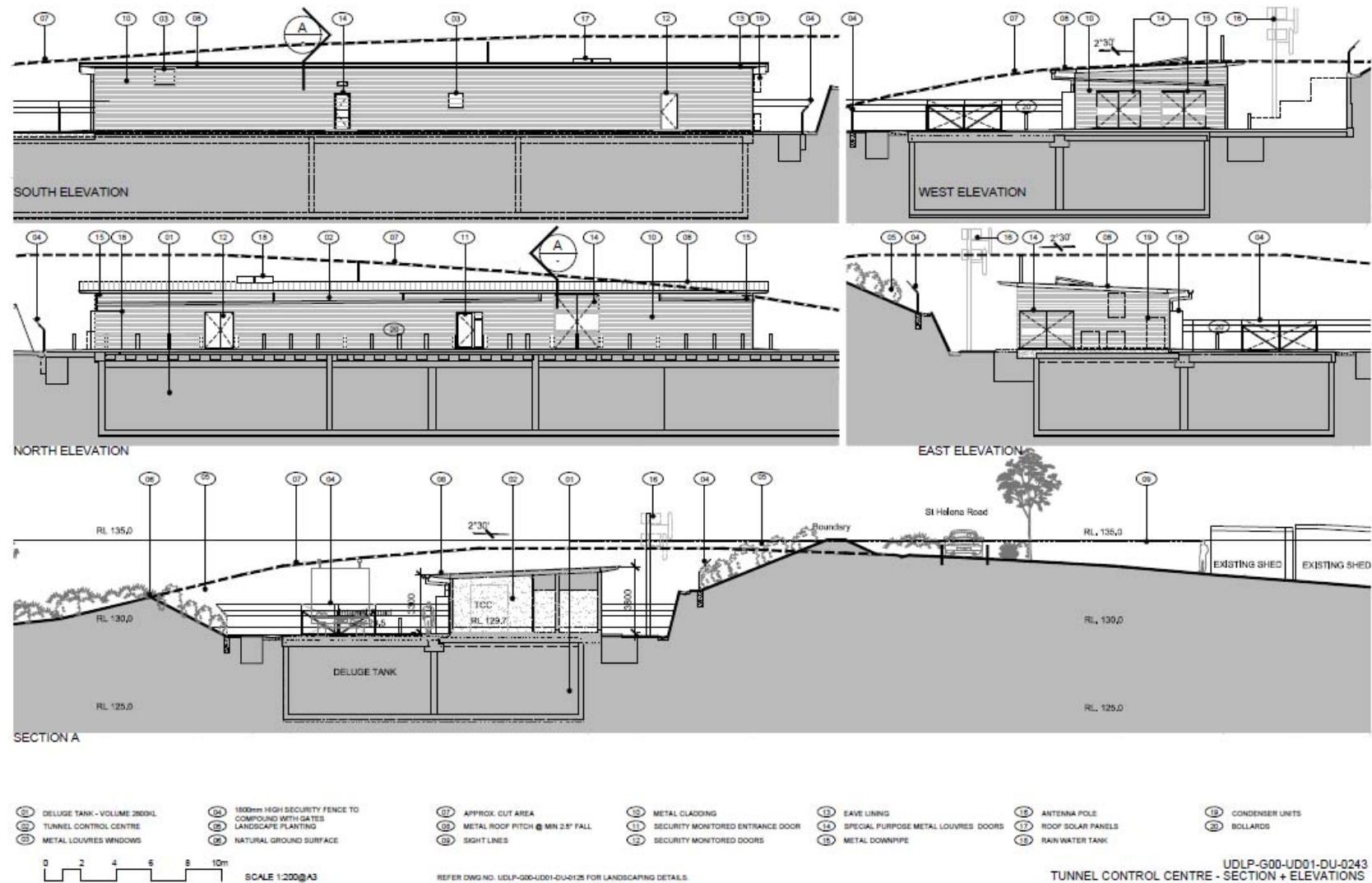


Figure 12 Section and elevations of the TCC (Conybeare Morrison and Context: I I I)

Figure 13 shows an artist's impression of an aerial view of the TCC 15 years after planting of landscaping, showing how the TCC and associated landscaping has been designed to blend in as unobtrusively as possible with the surrounding landscape.



Figure 13 Artist's impression of an aerial view of the TCC and associated landscaping after establishment (Conybeare Morrison and Context: 108)

As detailed above, the TCC is integral to the operation of the St Helena tunnel, and as a result has been a key consideration in the development of detailed design, urban design and landscaping on the project. The minor design refinements to the TCC have the following benefits, as they would: -

- provide adequate facilities to cater for extensive traffic management, emergency and communications systems;
- meet technical requirements for tunnel infrastructure;
- meet community expectations for this major piece of infrastructure within a landmark coastal location;
- significantly enhance the urban and landscape design outcome at this location; and
- result in less environmental and community impacts.

Construction impacts

Construction of the TCC and associated infrastructure would have a short-term negative visual impact upon the landscape, through clearing of vegetation, earthworks and other construction activities associated with excavation of the footprint for the deluge tanks and the TCC compound. These works would be visible from St Helena Road and from the Pacific Highway southbound up St Helena Hill. However, these activities would be occurring concurrently with other construction works for the T2E upgrade in this location, primarily works for the construction of the northern tunnel portals and bulk earthworks to raise the level of the land for the highway footprint north of the St Helena tunnel.

Operational impacts

Extensive modelling of the TCC with topographic information has been undertaken as part of the development of the UDLMP to determine the likely visual impact of the TCC and compound at local, middle and distant view sheds. The modelling undertaken demonstrates that the TCC building would not be seen from regional, middle or local views. Landscaping and mounding, in combination with the depressed location on the escarpment, would ensure that the building is discreet. Fences may be visible in the short term until the landscape is mature. Local view assessment included modelling from Nos 38 and 40 St Helena Road and from along St Helena Road.

Middle distance views such as along St Helena Road, from the existing Pacific Highway and the new alignment and from Ewingsdale interchange would be unaffected by the TCC due to its depressed location in the escarpment. The sunken and recessive design along with the mature landscape of the surrounding area and at the compound would obscure the facility. Long distance views, such as from the existing Pacific Highway and the new carriageways, Byron Bay and Ewingsdale, would also be unaffected by the TCC due to its depressed location in the escarpment. The mature landscape of the surrounding area and the compound would obscure the facility.

Figure 14 below shows long, medium and local views of the TCC. The view analysis shows the TCC building would be obscured with visual mounds and mature plantings.



Figure 14 – TCC 3D view studies (From Conybeare Morrison and Context: 107)

Management and mitigation of impacts

As can be seen from above, the Project design includes multiple measures to minimise and mitigate against potential visual amenity impacts associated with the construction and operation of the TCC, and would result in a net benefit from the existing situation through the rehabilitation of the entire St Helena ridge line via landscaping and revegetation with lowland rainforest species. Application of the Project UDLMP would be the mechanism for ensuring this occurs.

4.13 Air Quality

Background

Ambient air quality in the vicinity of the TCC was identified as complying with respective air quality goals for all measured levels of pollutants in the Project EA, based on existing monitoring data from Coffs Harbour (refer EA section 19.2.3, page 283).

Construction Impacts

The construction of the tunnel control centre has the potential to cause localised dust impacts for nearby residents during construction. Construction would include earthworks, building construction, rock

hammering and blasting for the subterranean water tanks. Access to the site for construction would be via St Helena Road which is sealed.

Operational Impacts

Operation of the TCC is not envisaged to cause any changes to ambient air quality in the vicinity of the TCC.

Management and mitigation of impacts

Construction air quality monitoring in the vicinity of the TCC would be undertaken via existing dust deposition gauges for the Project (the nearest gauges are located 35 metres to the east and 45 metres to the west of the proposed TCC as detailed below in **Figure 15**). Real time air quality monitoring would also be conducted during blasting as part of the Blast Management Plan which forms part of the NVMSP.

Blasting and earthworks excavation impacts would be consistent with impacts associated with the adjacent tunnel roadwork construction. Air quality mitigation measures for construction of the TCC would be as per the Blast management plan and AQMSP, with no specific additional measures proposed.

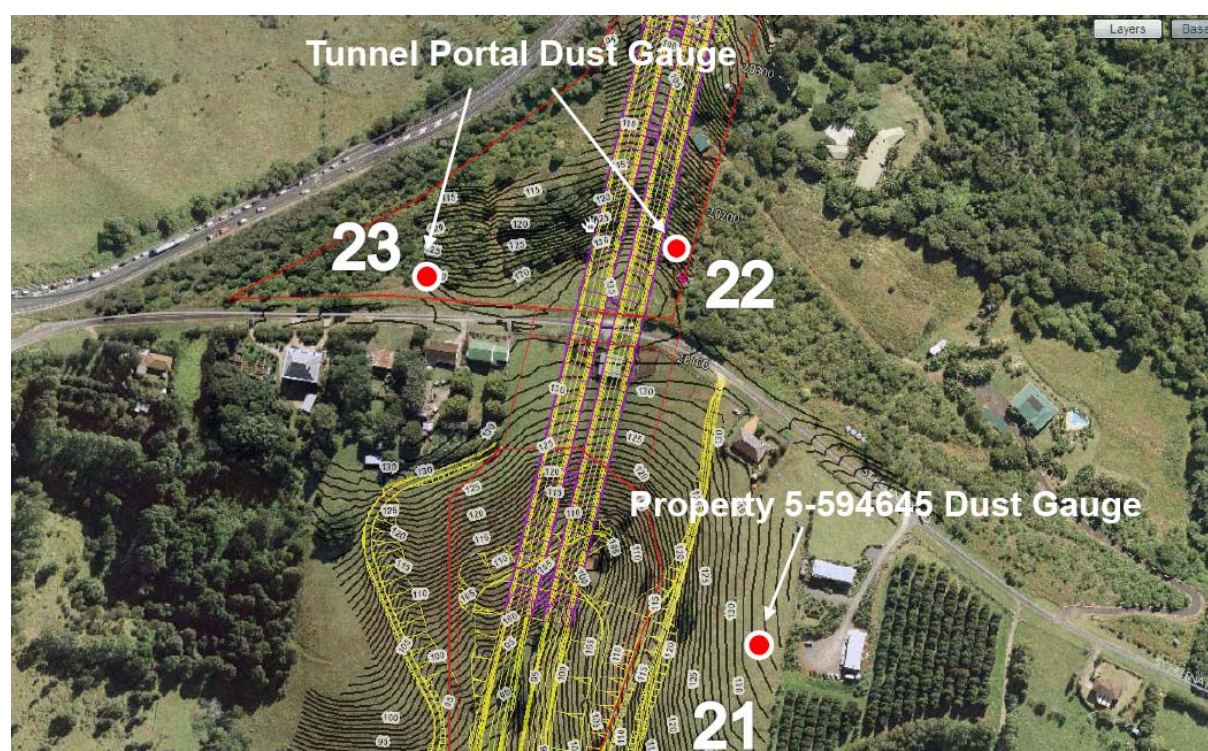


Figure 15 Location of dust deposit gauges

4.14 Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered for the proposed construction of the TCC.

Factor	Impact
Any impact on a World Heritage property?	No
Any impact on a National Heritage place?	No
Any impact on a wetland of international importance?	No
Any impact on a listed threatened species or communities?	No

Any impacts on listed migratory species?	No
Any impact on a Commonwealth marine area?	No
Does the proposal involve a nuclear action (including uranium mining)?	No
Additionally, any impact (direct or indirect) on Commonwealth land?	No

5 Conclusion

The proposed modification to construct a TCC as part of the T2E Project is required in order for RMS to operate the St Helena tunnel in a safe and efficient manner. In relation to the proposed construction of the TCC, the benefits to the local community, other external stakeholders and the environment gained from the proposed modification as part of the works to construct the T2E project are as follows:

-

- Biodiversity benefits associated with the removal of plantation material and weeds both within the proposed TCC site and on the remainder of that parcel of land and replanting with lowland rainforest species including koala feed trees to enable the land to realise its identified potential as a wildlife corridor.
- Contamination management benefits associated with the proper management of soils associated with the former use of the site as a banana plantation.
- Socio-economic benefits stemming from the improved speed and efficiency with which the management of a major incident within the tunnel, in addition to routine maintenance, would occur.
- Landscape and visual benefits from high-quality landscaping around the TCC, providing a more visually attractive outcome than the banana plantation and rubbish piles currently on the site.

This document demonstrates that there has been extensive communication and community consultation with adjacent residents and the wider local community regarding the proposed works, with opportunities provided for community members to comment and ask questions regarding the works.

6 Bibliography

Arup Pty Ltd 2008 *Tintenbar to Ewingsdale Upgrading the Pacific Highway: Volume 1 – Environmental Assessment*, a report to the NSW Roads and Traffic Authority

Boulderstone Pty Ltd 2012 *Ancillary Facilities Assessment: Tintenbar to Ewingsdale Pacific Highway Upgrade – Minor Creek and Southern Portal Compounds*

Boulderstone Pty Ltd 2013 *Tintenbar to Ewingsdale Project Construction Work Method Statement: Drill and Blast (above ground) Construction Management Plan*

Biosis Research, 2008 *Tintenbar to Ewingsdale Pacific Highway Upgrade: Terrestrial Flora and Fauna Assessment*, a report to Arup for the NSW Roads and Traffic Authority

Conybeare Morrison and Context Pty Ltd, 2013 *Urban Design and Landscape Plan, Tintenbar to Ewingsdale Project*, Commissioned by Boulderstone Pty Ltd

Environment Protection Authority, 1999 *NSW Industrial Noise Policy*

GHD 2013 *Pacific Highway upgrade – Tintenbar to Ewingsdale: Design Report GH01 – Hydrogeology Report, Final Detailed Design*.

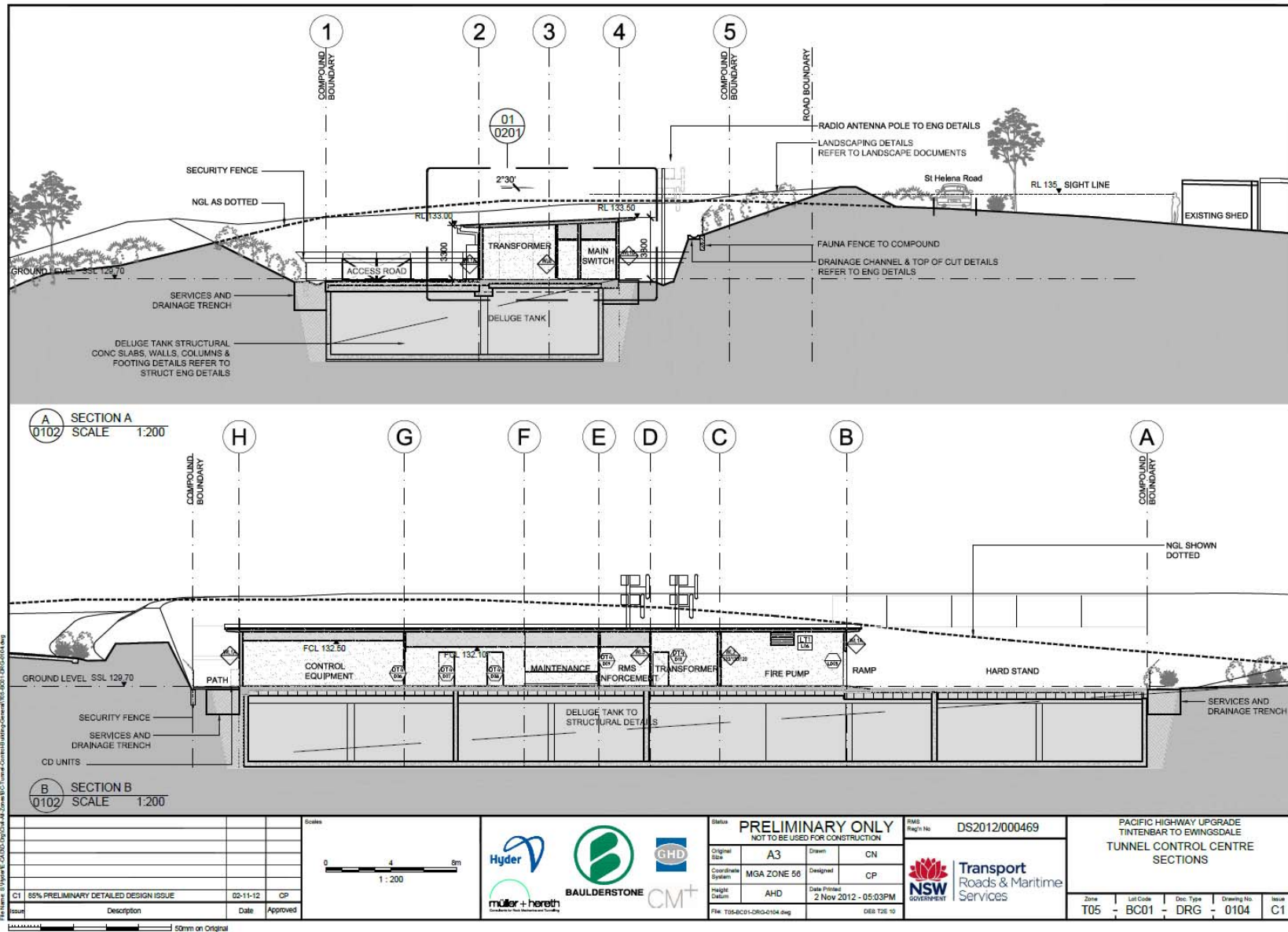
Morand, D.T 1994 *Soil Landscapes of the Lismore-Ballina 1:100,000 Sheet - Report*, Soil Conservation Service of NSW, Sydney

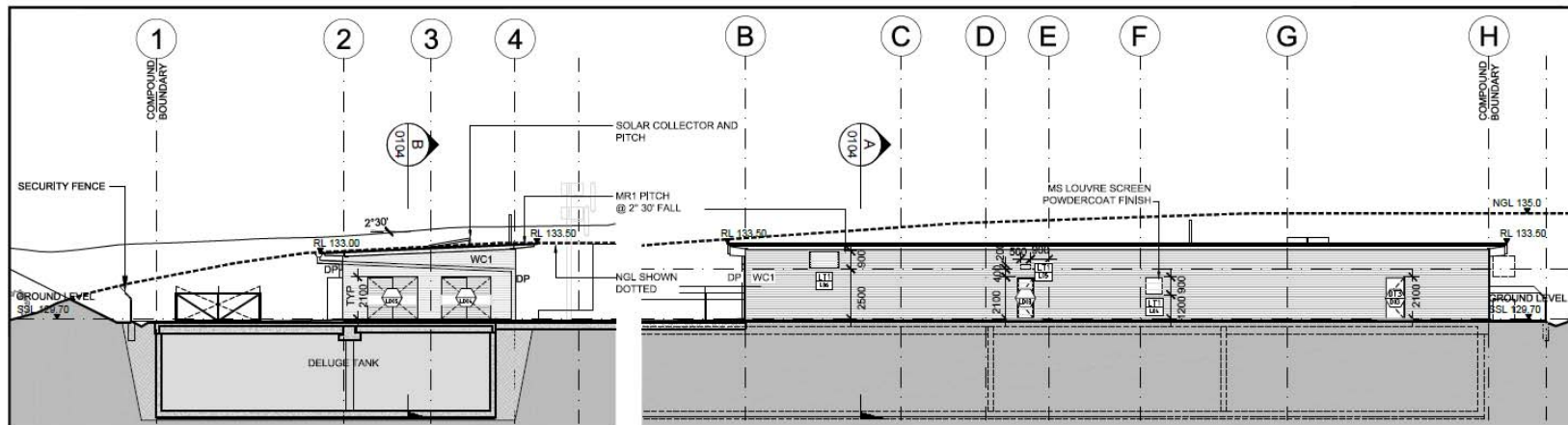
National Environment Protection Council 1999 *National Environmental Protection Measure (NEPM) for the Assessment of Site Contamination*

Navin Officer Heritage Consultants 2008 *Pacific Highway Upgrade – Tintenbar to Ewingsdale: Cultural Heritage Assessment*, a report to Arup for the NSW Roads and Traffic Authority

RCA Australia 2011 *Factual Report: Environmental Site Investigation Tintenbar to Ewingsdale Pacific Highway Upgrade – Banana Plantation Chainage 28100-28500*, Prepared for Aurecon on behalf of RTA

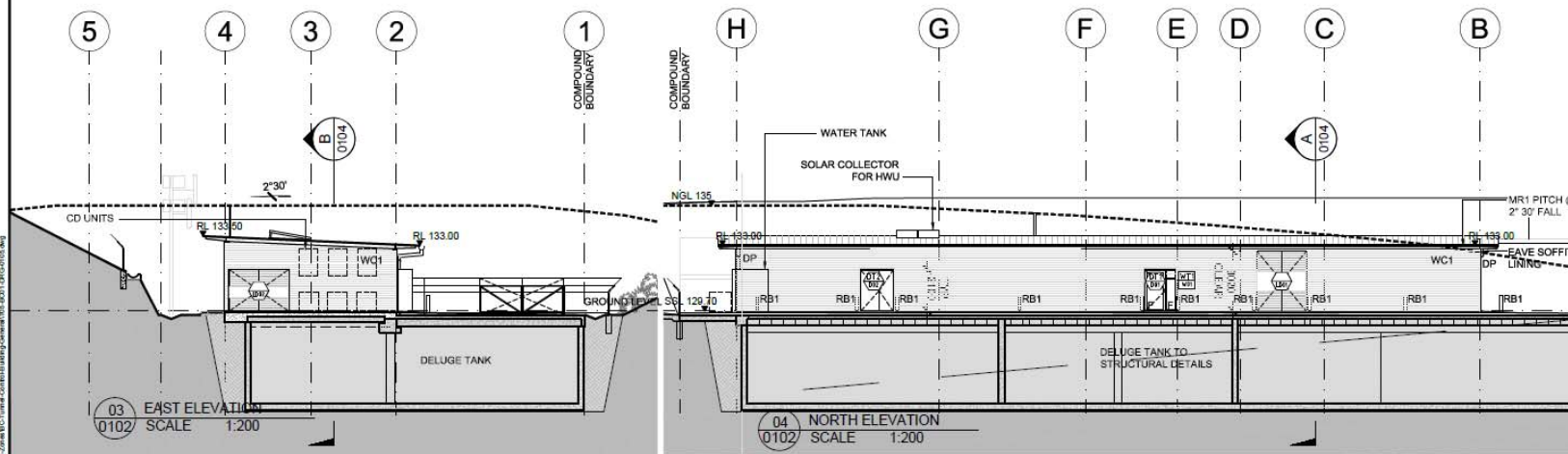
Appendix A – TCC Design plans





01 WEST ELEVATION
SCALE 1:200

02 SOUTH ELEVATION
SCALE 1:200



03 EAST ELEVATION
SCALE 1:200

04 NORTH ELEVATION
SCALE 1:200

01 WEST ELEVATION SCALE 1:200			02 SOUTH ELEVATION SCALE 1:200			03 EAST ELEVATION SCALE 1:200			04 NORTH ELEVATION SCALE 1:200		
01 WEST ELEVATION SCALE 1:200			02 SOUTH ELEVATION SCALE 1:200			03 EAST ELEVATION SCALE 1:200			04 NORTH ELEVATION SCALE 1:200		
01 WEST ELEVATION SCALE 1:200			02 SOUTH ELEVATION SCALE 1:200			03 EAST ELEVATION SCALE 1:200			04 NORTH ELEVATION SCALE 1:200		

50mm on Original



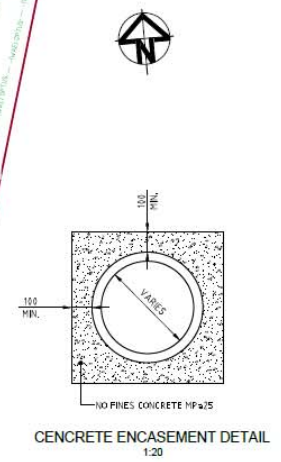
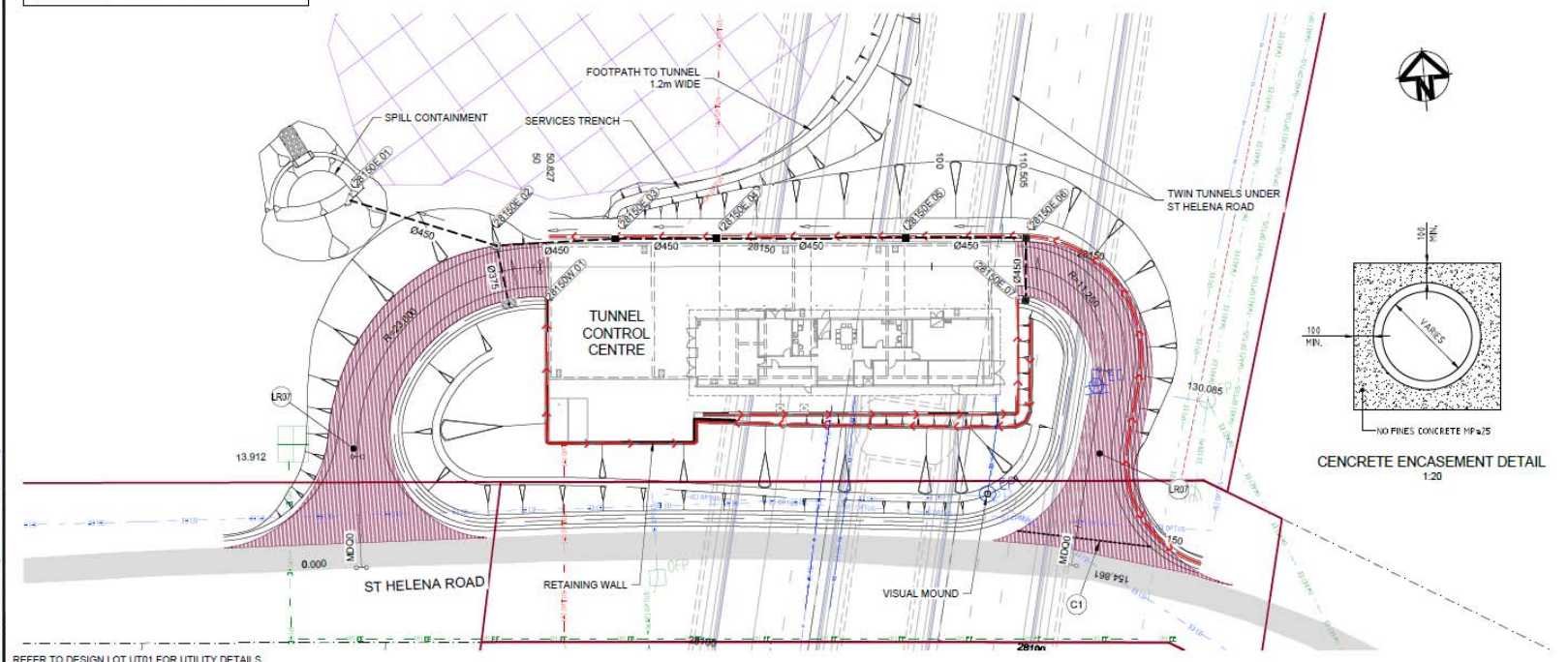
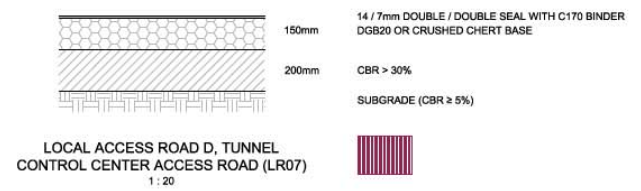
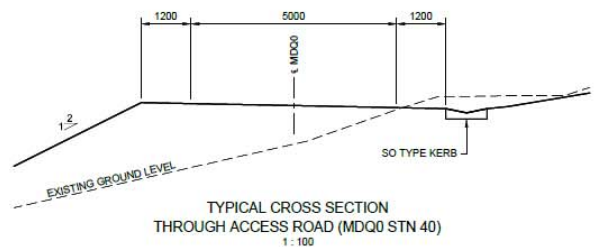
PRELIMINARY ONLY
NOT TO BE USED FOR CONSTRUCTION

DS2012/000469

PACIFIC HIGHWAY UPGRADE
TINTENBAR TO EWINGSDALE
TUNNEL CONTROL CENTRE
ELEVATIONS

Zone T05 - Lot Code BC01 - Dec. Type DRG - Drawing No. 0105 - Issue C1

- TUNNEL CONTROL CENTRE LEGEND**
- CATCH DRAIN
 - LOWLAND RAINFOREST TO BE PROTECTED
 - SITE BOUNDARY
 - LOCAL ROAD CORRIDOR BOUNDARY
 - TEMPORARY WORKS BOUNDARY
 - SERVICES CORRIDOR BOUNDARY
 - EXISTING TITLE BOUNDARY
 - EXISTING UTILITY
 - PROPOSED UTILITY
 - RELOCATED UTILITY
 - ABANDONED UTILITY
 - EXISTING CONTOUR
 - PROPOSED CONTOUR
 - EXISTING PAVEMENT



File Name: S:\pacific\T05-BC01-DRG-1003.dwg, User: S:\pacific\T05-BC01-DRG-1003.dwg, Date: 2012/11/03, Time: 10:03:11

REFLECT DESIGN OF SITE FOR OTHER DETAILS		Scales				     		Status PRELIMINARY ONLY NOT TO BE USED FOR CONSTRUCTION		RMS Reg'n No: DS2012/000469		  TUNNEL CONTROL CENTRE CIVIL WORKS COMPOUND PLAN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></</td></tr></table>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							</		

Appendix B – Community update regarding TCC

To the householder



Transport
Roads & Traffic
Authority

FEBRUARY 2013

CONSTRUCTION OF THE TUNNEL CONTROL CENTRE

Dear Resident/Community member

Re: Pacific Highway upgrade — Tintenbar to Ewingsdale Tunnel Control Centre

Roads and Maritime Services (RMS) has awarded a contract to Boulderstone Pty Ltd (Boulderstone) to design and construct the Pacific Highway upgrade — Tintenbar to Ewingsdale. This project is jointly funded by the NSW State and Federal Governments.

The upgrade will provide approximately 17 kilometres of dual carriageway, starting at the northern end of the Ballina bypass at Ross Lane and extending to the Ewingsdale interchange.

Tunnel Control Centre

The Tunnel Control Centre (TCC) will be a secure, typically unstaffed facility that will house some of the equipment and services used to remotely control, operate and maintain the twin St Helena tunnels during routine operation, maintenance and incident management.

The TCC will be 'sunken' and designed as low as possible to ensure it blends into the landscaping and cannot be seen from the road, which ensures that residents' views are not hindered. A key feature of the TCC is the design of the water storage tanks. These reinforced concrete tanks are located totally underground, providing a complete deluge system in case of fire within the tunnels.

What's happening?

From **early February 2013**, for approximately 12 months (weather permitting) the project team will commence construction of the TCC on the north side of St Helena Road, McLeods Shoot.

Earthworks, some open cut controlled blasting and rock hammering will be required to excavate the submerged site for the TCC, and in particular, the large underground reinforced concrete water storage tank (equivalent capacity of an Olympic swimming pool).

Construction staging - Please see map of the tunnel control centre compound overleaf

The TCC will be constructed in four stages, as follows:

Stage 1: Site establishment, including site access road and fencing (comprised of 1.8m chain link fence structure covered in shade cloth), installation of environmental controls and clearing and grubbing (approximately one month, weather permitting).

Stage 2: Excavation and bulk earthworks, including rock hammering, drilling and open cut controlled blasting and removal of excavated material (depending on site geology, approximately two to three months, weather permitting).

Roads and Maritime Services

Pacific Highway upgrade – Tintenbar to Ewingsdale
Reply Paid 85913, PO Box 604
BANGALOW NSW 2479

www.rms.nsw.gov.au/pacific | T 1800 882 787

This project is funded by the NSW State and Federal Governments.



Transport
Roads & Maritime
Services



Stage 3: Construction of underground in-situ reinforced concrete water storage tanks, (approximately three to four months, weather permitting).

Stage 4: Construction of the physical building and fit-out (approximately six to seven months, weather permitting).

Noise, dust and vibration

The project is subject to strict environmental controls, including managing construction noise, dust, over pressure and vibration impacts.

The open cut controlled blasting operations will be carried out in accordance with the project's approved Noise and Vibration Management Plan. Each open cut controlled blast will be a brief and relatively minor event and noise and vibration outside the vicinity of the blast zone will be minimal.

Local exclusion zones will be established and enforced by safety spotters. This will require the stopping of traffic on St Helena Road for up to 5 minutes and potentially rolling stoppages on the Pacific Highway, the need for which would be determined on a case by case basis. Any stoppages will be coordinated to ensure that they have minimal impact on the local community. Provision will be made to ensure that emergency access is maintained during any road closures. For safety reasons, some residents within close proximity to controlled blasts may be asked to remain indoors or be temporarily relocated during controlled blasting. The community relations team will be in contact with affected residents in advance.

Rock breaking works are, by their very nature, a noisy activity and all reasonable steps will be taken to reduce noise and vibration impacts, where possible. The following mitigation strategies will be implemented to reduce potential noise, vibration and dust impacts during this construction process:

- Sound baffling will be used on equipment where possible.
- Construction noise levels will be monitored in accordance with the Noise and Vibration Management Plan for the project to ensure noise levels comply with the approved limits for the project.
- Vibration and air overpressure monitoring will be undertaken to ensure works are kept within approved vibration limits.
- Ongoing dust monitoring will continue as part of these works.

While construction activities will take place during approved construction hours (Monday to Friday 7am to 6pm and Saturday 8am to 1pm) noisy activities such as rock breaking will be carried out between 8am and 6pm Monday to Friday and between 8am and 1pm on Saturday, in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work.

The project team appreciates your patience and understanding during construction and apologises for any inconvenience this work may cause.

Roads and Maritime Services

Pacific Highway upgrade – Tintenbar to Ewingsdale
Reply Paid 85913, PO Box 604
BANGALOW NSW 2479

www.rms.nsw.gov.au/pacific | T 1800 882 787

This project is funded by the NSW State and Federal Governments.



Transport
Roads & Maritime
Services



If you require more information or have any queries, comments, or complaints, please contact the community relations team on **1800 882 787** (24 hour toll free) or email communityinfo@t2e.com.au or visit the project website at www.rms.nsw.gov.au/pacific (see Tintenbar to Ewingsdale project).

Yours faithfully



Vincent Newton
Boulderstone Project Director

Roads and Maritime Services

Pacific Highway upgrade – Tintenbar to Ewingsdale
Reply Paid 85913, PO Box 604
BANGALOW NSW 2479

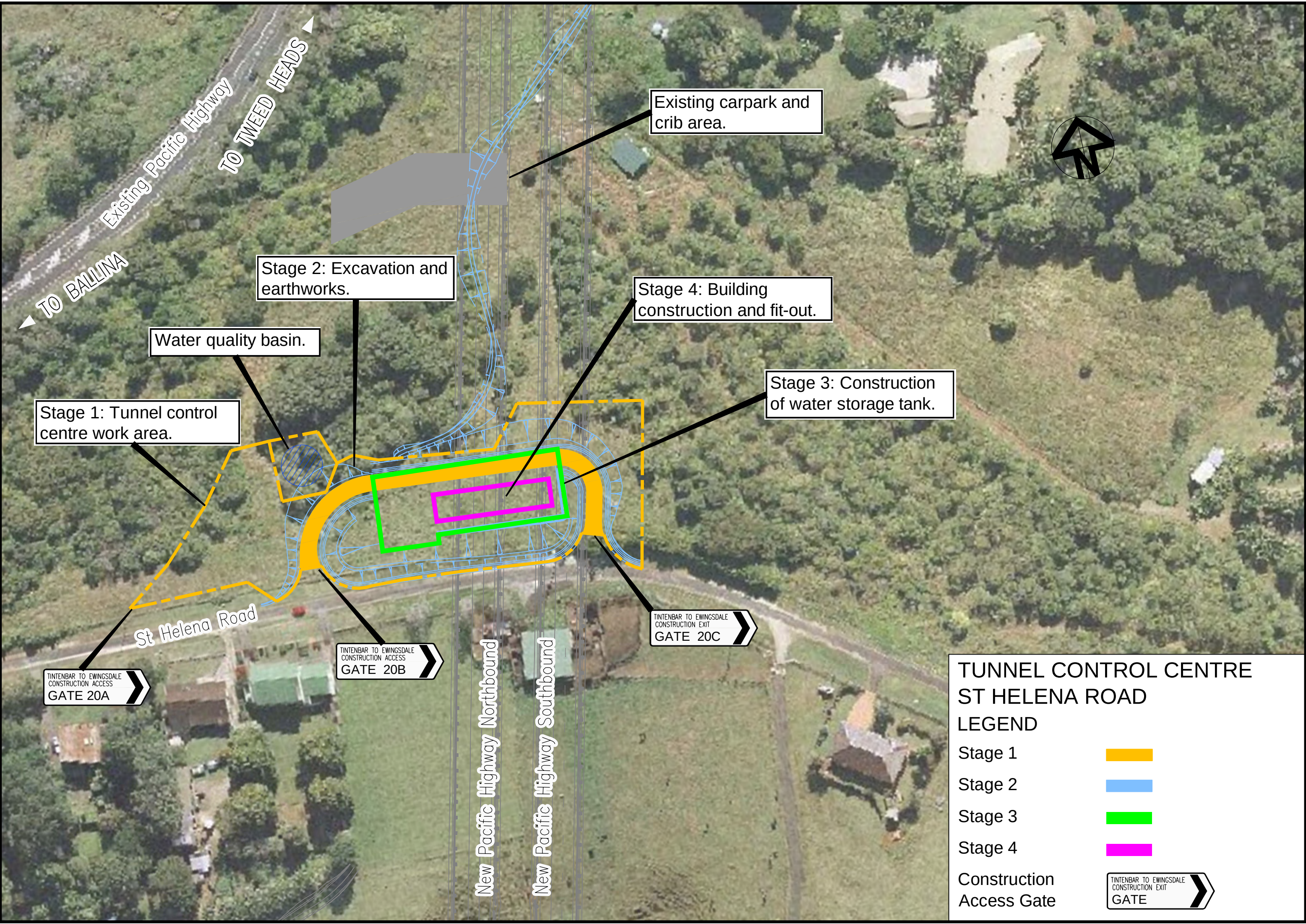
www.rms.nsw.gov.au/pacific | T **1800 882 787**

This project is funded by the NSW State and Federal Governments.



Transport
Roads & Maritime
Services





Stage 1: Tunnel control centre work area.

Water quality basin.

Stage 2: Excavation and earthworks.

Existing carpark and crib area.

Stage 4: Building construction and fit-out.

Stage 3: Construction of water storage tank.

TINTENBAR TO EWINGSDALE
CONSTRUCTION ACCESS
GATE 20A

TINTENBAR TO EWINGSDALE
CONSTRUCTION ACCESS
GATE 20B

TINTENBAR TO EWINGSDALE
CONSTRUCTION EXIT
GATE 20C

TUNNEL CONTROL CENTRE ST HELENA ROAD LEGEND

- Stage 1
- Stage 2
- Stage 3
- Stage 4

Construction Access Gate

TINTENBAR TO EWINGSDALE
CONSTRUCTION EXIT
GATE

Appendix C – St Helena Road street meeting notes

MEETING NOTES



Transport
Roads & Maritime
Services

21 MAY 2012

Name of meeting: St Helena Road street meeting — Tunnel Construction, Blasting & Vibration

Location of meeting: Kevin and Edna Jarrett's property (58 St Helena Road, McLeods Shoot)

Date: 21 May 2012 **Time:** 5.30pm – 8.49pm

Attendees: Project staff:

Peter Borrelli (RMS Senior Project Manager and Representative for the Contract)
Vince Newton (Boulderstone Project Director)
David Packer (Boulderstone Construction Manager)
Mark Dowell (Boulderstone Tunnel Manager)
John Heilig (Tintenbar to Ewingsdale blasting consultant)
Susan Scott (Boulderstone Community Relations Manager)
Matthew Saviana (Boulderstone Roadworks Manager)
Ian Shilling (Boulderstone General Superintendent)
James O'Connor (RMS Assistant Resident Engineer)
Abby Wallace (Boulderstone Community Relations Coordinator)

Residents: (17attendees)

Kevin & Edna Jarrett
Donna, Gary and Luke Jarrett
Pam & Martin Brook
Albert & Winsome Ormsby
Khan & Tracey Silinzieds
Warwick Brown
Gary Singh
Jan Hulbert
Kaz Toubin
Brian Bowden
Guy Ruthven (Cornell family representative).

AGENDA ITEMS:

Item	Description
1.	Welcome and introductions (SS)
2.	Overview
3.	Tunnel, including design and benefits
4.	Blasting
5.	Why?

6.	Potential environmental impacts, including vibration and airblast overpressure
7.	Types of controlled blasting (open cut and tunnel)
8.	What to expect
9.	Mitigation strategies
10.	Vibration measurement
11.	Monitoring
12.	Excavation methodology
13.	Proposed changes — blasting hours/vibration/airblast limits
14.	Benefits of change
15.	Vibration contours
16.	Questions.

NOTES:

Item	Topic	Personnel
	Welcome Community Relations Manager, Susan Scott, welcomed attendees, introduced the project team in attendance and outlined the agenda for the session. Note: The content regarding the above mentioned agenda is covered in the presentation.	SS
	Question / comments from residents (<i>not for publication</i>): Question (Pam Brook): Where you say it is 'cut and cover' – does that mean it is the entrance to the tunnel? Dave Packer advised that yes the 'cut and cover' sections were at the entrance to the tunnels and primarily describes the method of construction. Question (Janette Watchorn): At the entrance to the tunnel it looked like there was a little road coming off to the side. What is that? Dave Packer explained that it wasn't a road coming off to the side, but rather emergency breakdown bay before you enter the tunnel. Question (Janette Watchorn): Is that (image) correct? Will the tunnel be three lanes in both directions? Peter Borrelli explained that the tunnel has been designed for the provision of three lanes in both directions. There will be three lanes southbound through the tunnel, including a third climbing lane that will be constructed on the southbound approach to the tunnel from the Ewingsdale interchange and two lanes northbound, including a wider shoulder that can be converted to a third lane in the future. With the design for the tunnel it is not easily possible to widen the tunnel in the future and hence provision needed to be made now. Question (Kaz Toubin): Are the fans noisy inside the tunnel? Peter Borrelli explained that the fans will only operate in an incident i.e. fire etc. Question (Donna Jarrett): Is there access from one tunnel to the other and is that access permanently open? Dave Packer advised that there is permanent emergency access between the tunnels located every 120m (three in total) with a weighted sliding door which is easily opened during emergencies. Peter Borrelli added that in the unlikely event that there was an accident e.g. fire in tunnel, pedestrians who have exited their vehicles could use the exits to cross over safely into the other non-incident tunnel and exit that way. Question (Donna Jarrett): Will they be open all the time and will there be pedestrians walking through there? For example, hitchhikers? Peter Borrelli advised that the doors are alarmed and monitored and there will be CCTV cameras monitoring if anyone touches the door and an alarm is set off. Question (Kaz Toubin): Where is the exhaust from the tunnel released? Dave Packer explained that the tunnel is short enough and of sufficient cross section to self-ventilate. Susan Scott added that there won't be 'ventilation stacks'. Question (Pam Brook): Are there provisions for three lanes because one (tunnel) will be busier than the other? Peter Borrelli explained that the third lane southbound is in place as a climbing lane initially, and a third lane may be opened northbound in the future when traffic volumes warrant it.	

	Peter also explained that we have made the provision for the third lane now as it is very difficult to add lanes later. David Packer added that the space for three lanes must be created now, because this type of tunnel (fully tanked tunnel) would be cost prohibitive to widen in the future. Question (Albert Ormsby): What is the maximum dimension of the tunnel? Dave Packer explained that it is 19 metres in width and 12 metres in height. Question (Albert Ormsby): Can you water it down? (The blast overburden so as not to produce as much dust). Mark Dowell advised that a little water to dampen it is OK, but too much can affect the blast. Question (Pam Brook): Does the blasting disrupt rock layers in the ground? Mark Dowell responded 'no, because it all moves together'. Question (Pam Brook): I'm just thinking of things like underground concrete tanks? John Heilig explained that it's different. For example, in the recent Christchurch earthquake the ground moved 0.6 – 1 metre, compared to 100 μm, Or the thickness of a sheet of paper, which is what we are talking about here. Question: So you can hear thunder, aircraft etc. Can you hear overpressure? Mark Dowell advised that you cannot hear overpressure as the frequency is so low it cannot be picked up by the human ear. Question (Martin Brook): What is the TCC? Mark Dowell advised that (the acronym) stands for the Tunnel Control Centre. Question (Winsome Ormsby): Can you explain where the emergency access will be (reference to 'emergency access will be maintained at all times')? Dave Packer advised that blasting activities can be stopped to provide emergency access e.g. to let an ambulance get through along St Helena Road. Question (Pam Brook): What about livestock? Mark Dowell advised that livestock may be disturbed in the first couple of blasts, but then they would settle down once they became accustomed to it. The project team will discuss the potential impacts on livestock with individual affected property owners before each outdoor controlled blast. Comment (Donna Jarrett): We have different cattle coming in and out of our property so if you are blasting regularly it is likely to be new animals in the cattle yards every couple of days. Peter Borrelli advised that is what we need to talk to property owners about so we can manage all of those things together. Comment (Jan Hulbert): And you couldn't get any closer to the blasting at the tunnel where the stock yards are. Question (Martin Brook): Will there be a letter from the head of RMS and the Minister which indicates that if there is a damage issue, there is an agreement to make good? Peter Borrelli advised that there would be a letter outlining agreement to undertake repairs, if the damage was found to be caused by the project. Question (Martin Brook): Who will sign the letter? Peter Borrelli advised that letter to undertake repairs would be signed by the Boulderstone Project Director as well as a blasting fact sheet provided on RMS standard letter head. Question (Winsome Ormsby): Would this be an insurance claim? Peter Borrelli advised that the project insurance company would manage it depending on the size of the claim and the extent of the damage. RMS has a Principal Arranged	
--	---	--

	Insurer, but it's unlikely to become an insurance matter. Question (Warwick Brown): What happens if Baulderstone goes broke? Peter Borrelli explained that Baulderstone is a very large construction company and a top tier contractor Who has undergone financial assessment (as part of the tendering process) and has provided a large security as part of the project contract. Comment (Martin Brook): I think we would feel much more comfortable if that letter came from the Government. Peter Borrelli advised that this is the arrangement on all RMS projects. Peter Borrelli further cautioned about being too negative and creating unnecessary fear and added that there is no expectation of damage, and if any at all it will not be significant. Dave Packer added that Baulderstone Pty Ltd is owned by Lend Lease which is a large international company. Question (Pam Brook): With two houses very close to the project, both have underground concrete water tanks. The tanks will need to be inspected prior to the start of construction. I think this process needs to be addressed. How will you address this? If there is a leak in a water tank, it might be difficult for them [property owners] to relate that damage to the project. Vince Newton advised that Baulderstone will have individual conversations with property owners to organise appropriate inspections. We are arranging a structural engineer to carry out a structural inspection of all properties in this area. This is in addition to the pre-condition survey that has already been carried out and will include the underground water tanks. Vince Newton explained that we want to know about these things now so we can organise inspections. Peter Borrelli added that pre-condition surveys of properties have been completed and you will have a report that documents the condition of property. If we have missed anything please let us know so we can correct that. Comment (Donna Jarrett): We have raised that [the concrete water tanks] quite a few times but they were missed on the property condition report. We do keep bringing it up, because we don't know who is dealing with it. One of the property owners (Sally Gilmour) is in Sydney. Peter Borrelli advised that it is an action. Please let us (RMS) or the Community Relations team know and we will look into it. Let us know if there is anything that we may have missed. Question: Does the rock get taken away from here or does it get used on the road? Dave Packer advised that it will get crushed and used during construction of the new highway. Question (Pam Brook): Where does the rock get crushed? Dave Packer explained that it won't be crushed in the immediate vicinity of the tunnel; it will be further south down towards the Tinderbox valley. It has to be 250m from the nearest resident. Question (Winsome Ormsby): Does that mean that people will be woken up at night and not be able to get to sleep again [referring to 24 hour tunnelling]? Mark Dowell explained that there will be soundproof doors that will close on either end of the tunnel and evening shifts will come in and the door will close and they won't open again until the morning. Question (Winsome Ormsby): I understand that but is there going to be any noise in this area when people will be sleeping? Susan Scott added that night works will be inaudible. Question (Martin Brook): Are those set times part of your contract? Mark Dowell explained that they are part of the Ministers Conditions of Approval for the project.	
--	--	--

Question (Albert Ormsby): What is the very outside line? The purple one [referring to the slide presentation]. John Heilig advised that line indicates the vibration contour at 5mm/s. Question: Didn't you say that at times it could get to 25mm/s? John Heilig explained that the vibration in the immediate vicinity of the blast will be higher but that the vibration at the nearest residences will not exceed the allowable limits. Peter Borrelli added that limits are set at 5mm/s and can never exceed 10mm/s. 95% of our blasts will be below that. The way it is set up is that we can never exceed 10mm/s. Although it is 15mm/s the blasts are always set at less than that so we are sure to never go above that level / limit. If an increase was approved to 15mm/s, it would never exceed 20mm/s. Question (Kaz Toubin): In the last few slides, you talked about evacuations. If that was to happen would that be for—hours or days? And are you saying some people would stay indoors and some would leave? Dave Packer advised that trial blasts need to be undertaken to measure how the rock behaves so the blasting models can be verified. As a preliminary precaution, we would ask the people in close proximity to the blast location to stay indoors. There are two distinct types of blasting. The first is controlled open cut blasting which will include the tunnel portals and the tunnel control centre on the surface. Then we have the controlled tunnel blasting where the charges will be smaller, with the bulk of the blasting being underground tunnel blasting. The first initial process is where we need to take extra precautions. Susan Scott added that the open cut blasting is similar to the blasting shown in the videos in the presentation tonight. Question (Donna Jarrett): What level of blasting did you do at the hospital [directed at John Heilig]? John Heilig advised that it was a smaller scale but the limit there was 25mm/s. It was very hard rock and when the redevelopment was going on, there were hospitals on three sides and we had the option to drill and blast or use a hydraulic hammer and they chose drill and blast because it was over and done with a lot quicker. John added that you will certainly feel blasting but it will not damage your property. Question (Donna Jarrett): So nothing as much as a crack in the concrete? John Heilig advised "No, I've never non-intentionally damaged a structure". Question (Martin Brook): So what happened at the Lane Cove tunnel? Mark Dowell advised that they were developing an off ramp that came across quite a low junction and there were issues with the bolting and roof support. Mark advised that it was the coming together of different elements that caused that tunnel to collapse. Vince Newton explained that they weren't tunnelling through rock for that section of the Lane Cove tunnel. Question (Martin Brook): What happened at the Canberra hospital? John Heilig explained that blasting at Canberra was an implosion. They were demolishing a building. We are trying to contain the energy. They would have had almost no vibration; it would have been overpressure. Question (Martin Brook): Have you ever damaged a building? John Heilig explained that we did damage a building intentionally once where the vibration was set at 75mm/s. Question (Donna Jarrett): Did I hear somewhere that this type of tunnel construction hasn't been done before in Australia? Mark Dowell explained that the St Helena tunnels are big tunnels but we have certainly done similar tunnels in Australia. In Melbourne they have done a similar size excavation. They don't come along that often and the preferred method is using a roadheader.	
--	--

	Dave Packer added that the Airport Link tunnels in Brisbane were very large tunnels and they used roadheaders, not the drill and blast method. Comment (Kevin Jarrett): Just get the job rolling. Question (Kaz Toubin): By increasing the hours of blasting, how much do you decrease the time of the actual project? Mark Dowell explained that it will be approximately 1 – 1½ months. There are lots of different effects and it depends on the geology as to how well we proceed. Comment (Pam Brook): We would like to know where the rock crushing machine will be located. In terms of noise for residents — breaking up rocks sounds pretty noisy. Mark Dowell explained that there will be rock hammering at the tunnel portals and tunnel control centre. Comment (Martin Brook): Pam is talking about rock crushing operations on the project [not rock hammering]. Dave Packer explained that rock crushing won't occur in the immediate vicinity of the tunnel. It will be in the Tinderbox Valley vicinity. Operations must be at least 250 metres from residents and 200 metres from waterways. With modern day crushers it is so much quicker and less noisy and we put them in locations where we can comply with the conditions and where they have minimal impacts. Question (Martin Brook): Do you have an idea where you will put them? Peter Borrelli advised that it is not in our interest to put them in a place where there are impacts to people. Dave Packer added that it is about finding a balance and in an area with the least impact. Comment (Donna Jarrett): If you have to be 200 metres from waterways, it will be hard. Question (Jan Hulbert): What kind of surface will you be putting on the road from here to Bangalow? Peter Borrelli explained that it is a concrete surface. Comment (Jan Hulbert): I was talking to my son who lives in Queensland near a highway with a concrete surface and he explained that the noise is unbearable. He said that whoever did the road up there said “too bad it’s done”. Peter Borrelli explained that RMS has done a lot of noise modelling for this project and will comply with and meet all the noise obligations for the project. Comment (Jan Hulbert): Why are they hammering the concrete on the highway near Ballina and near Yelgun? Peter Borrelli explained that they are replacing some seals at Ballina and at Yelgun to Chinderah it is maintenance — there has been some soft soil settlement and the concrete is being replaced and reinstated. Comment (Jan Hulbert): If you put a concrete road down here, we will get all the noise with the southerlies. Comment (Martin Brook): At the start of the project – we had no clue at all that the tunnel was going to go through here [St Helena]. In the discussions with Arup and Peter Borrelli’s predecessor from the RTA, we were told that we were getting an asphalt road. If you look at the diagram in the presentation it is an asphalt road. Peter Borrelli explained that the diagram is an artist’s impression. The pavement is concrete. Comment (Martin Brook): We were led to believe that wasn’t going to happen and we have some major issues we would like resolved. Comment (Pam Brook): We have concerns about the use of St Helena Road and	
--	---	--

	the truck movements planned. We want truck movements clearly defined. How many per day, coming in and out and what time of the day? Dave Packer explained that on average it is about 60 trucks per day plus small / light vehicles. Question: (Donna Jarrett) Is that 60 trucks plus light vehicles or 60 truck movements? Dave Packer advised that on average it will be approximately 60 per day but we will have to clarify. I would assume that is 60 in and 60 out but we will need to follow up with you to make sure. <i>Clarification – there will be an average of 60 trucks per day, which equates to one truck in and out every 10 minutes. In addition, there will be approximately 60 light vehicle movements every day, which again equates to an average of 1 light vehicle in and out every 10 minutes. It is also noted that the project team is implementing several measures to minimise the vehicle use of this access, such as ferrying the tunnel workers in / out using buses (i.e. minimising use of private vehicles) and fast tracking the construction of Byron Creek bridge to provide an alternative access from the south.</i> Comment (Brian Bowden): We were told that our vehicle access movements would remain the same. We use trucks and operate buses. Will we still be able to turn right onto the highway? Yes, you'll be able to turn right onto the highway. It's different for us as a company — unless it's a designated intersection, we will be using it as a left in/left out for the safety of our workers and the community. Question (Brian Bowden): We want to know where you are going to turn around if you are only doing a left in, left out arrangement? Dave packer explained that the project won't be changing access for residents; these rules will only apply for project staff. <i>Clarification – there will be no change to existing conditions for the residents. Any construction traffic that exits left from St Helena Road onto the highway and needs to turn around, will do so at Coolamon Scenic Drive lookout, which has enough space to accommodate this (and existing traffic turn provision). This is considered to be a much safer option.</i> Comment (Donna Jarrett): Kids catch the school bus at the top of Coolamon Scenic Drive, is that where you will be turning around? Dave Packer advised that there is a detailed traffic plan, however, he would clarify this situation. Consultation is currently ongoing with local bus/school bus companies to ensure there is no impact on the existing operation of these services or to the safety of school children. Comment (Brian Bowden): We need to know just exactly what is going on as we are subject to contracts and need to be able to inform the Department of Transport. Peter Borrelli advised that we are not changing any traffic arrangements for residents. Boulderstone may need to talk to you about safe pick up points. We will maintain access at all times. Question (Jan Hulbert): Will there be a speed limit on the road, during construction? Peter Borrelli advised that yes there will be a speed limit during construction. Comment (Jan Hulbert): Cars are doing 100km/h on the crest here. Dave Packer advised that Boulderstone will continue to talk to the police and have them add this road to the list to watch, however there will be no guarantees. We've had meetings with the police and we are more than happy to advise police about this road. This issue was raised with Sergeant Dave Carter from Ballina Highway Police on 23 May. Sergeant Carter advised that	
--	--	--

	the local residents should contact Ballina police station direct to express their concerns. Under existing police procedures this will trigger some additional police/patrols and surveillance in this area. Comment (Pam Brook): St Helena road is the Byron Bay bypass. Widening the road and then stopping the work just before the crest is not safe. Can you widen beyond the crest for safety reasons? Dave Packer advised that Boulderstone have not provided council with the details of the road upgrade yet. Boulderstone will seek feedback from Council before we do anything and will certainly take that on board. Vince Newton explained that a road safety audit will be done on the design. This looks at things like site distance/signage etc. <i>Clarification – the option of extending the road past the crest was considered during the initial planning phase, but was not adopted. This was due to concerns that upgrading the road in this area would compound the problem due to vehicles travelling at an increased speed, and furthermore was not functionally required to build the highway upgrade. The proposed upgrade of the road between the tunnel access points and St Helena road will include a full detail design which will consider and address the safety issues raised and which will be reviewed and approved by RMS. It is envisaged that these issues will best be addressed using signage and reduced speed limits. Once complete, the upgrade will also undergo a full Road Safety Audit by a qualified Traffic Engineer to ensure that the road is safe for all users.</i> Comment (Khan Silinzieds): GPS is diverting people onto St Helena Road, the same as at Grafton. We get huge caravans and they have nowhere to go. Comment (Pam Brook): They will come down here and then stop. Dave Packer advised that it [St Helena Road] will be a fully designed scheme, including a traffic safety audit. Peter Borrelli also added that once the highway is upgraded the bulk of the current highway traffic (i.e. not local traffic) will be travelling on the upgraded highway and will not have the opportunity to make such a trip. Question (Pam Brook): Are you able to clear the Bana grass on the side of the highway? Peter Borrelli advised that there will be no issue with clearing this Bana grass. <i>Clarification – we have no problem in trimming and maintaining this grass for the duration of the project works. Susan / Ian Shilling to arrange site visit with appropriate residents to view extent of slashing to be carried out.</i> Question (Winsome Ormsby): When is the speed limit going to be lowered on St Helena Road? You need a sign that says: wildlife area – people live here! When will it be done? Peter Borrelli explained that during the project construction we will have construction speed limits in place (typically 40km/h) and after we open up we will put a new speed limit up. From discussions with Council, we are not sure if it will be 50km/h or 60km/h limit. We are still working through these things and talking to Council. It most likely will be 60km/h as it is not an urban area. In Bangalow where there is a greater density of houses, and hence there is a lower speed limit of 50km. Speed limits should be self-regulating i.e. if you put a speed limit in an area that people won't obey because they can't see an immediate need for it, it doesn't work. We have to be consistent in our application of speed limits around the state. It is very easy to focus on the negative. The alternative is if the road wasn't	
--	---	--

	sealed or widened you would have exactly what you have now. There are pluses and minuses; it's how we manage it. Comment (Jan Hulbert): The speed is unbearable. Peter Borrelli advised that he understood you are getting a lot of traffic because people use it as a back route to Byron Bay. Once the highway upgrade is completed and if you are travelling on the Pacific Highway you will have to make a deliberate decision to get off at Bangalow or Ewingsdale interchanges to access St Helena Road. Traffic on St Helena road will then be local traffic and users will be familiar with that route to get into Byron Bay. Question (Janette Watchorn): If there are no hiccups with the process, how soon will you start? August–September? Dave Packer explained that we are still going through the environmental approval process. The design is progressing very well and there are approximately 120 designers currently working on the project. Some early packages are now starting to be ready for construction and fencing work will start in the next three weeks or so. At tender time, there are a number of environmental criteria that are set, including a series of sub-plans and a high level of detail needs to be provided such as how we control dust and noise. These plans will be issued to Department of Planning and Infrastructure (DoPI) in the coming weeks, and once DoPI are satisfied with the documentation, we will get the approval to start. Comment (Pam Brook): In relation to the tunnel control centre blasting, we are concerned about dust. People on this road have tank water and contamination of water supply is an issue and is critical. Dave Packer advised that the videos shown don't give a very good idea of dust management. We will be managing the dust at the source using a variety of dust control measures. Question (Janette Watchorn): Will you use dust mats? Dave Packer explained that we use blast mats or overburden (wetted down) to stop any fly rock. These measures can also considerably reduce the amount of dust generated. Question (Pam Brook): In relation to the water filtration system, how do you stop massive amounts of dust settling on roofs? Dave Packer advised that we will be managing the dust in accordance with the Environmental Dust Management Sub-Plan for the project and there is no expectation for large amounts of dust to be settling on roofs. Question (Brian Bowden): In relation to the road surface, I've been led to believe that there are various grades of concrete road surfacing including noise suppressed types of roads. I am interested in finding out what the road surface will be? Peter Borrelli advised that with the concrete pavement there is a certain finish on the concrete for safety reasons. There are extremely tight controls on paving. We understand the noise concerns, however, we need to use a concrete pavement that gives surface texture for skid resistance for road safety reasons. There are tight controls over paving and finishing and we need to comply with the noise level requirements set for the project.	
--	---	--

Question (Khan Silinzieds): Is there a similar road texture [that's been used] anywhere around here?

Peter Borrelli explained that the section of the Pacific Highway near Tandy's Lane would be similar.

Comment (Martin Brook): I take your point about noise protection, however, our property has been treated for noise and it makes no difference at all. There are 40 properties in this area. You said that the type of treatment depends on density of the population. Aren't 40 houses enough to qualify for low noise pavement?

Peter Borrelli explained that noise treatment 'at residence' or 'at road' falls under what we call "reasonable and feasible".

Where houses aren't clustered in a significant density, and are typically located individually at distance from the road, you get a better result and a greater noise reduction by doing an 'at residence' treatment.

Comment (Winsome Ormsby): That's not good enough.

Question (Jan Hulbert): What happened at the Alstonville bypass?

Peter Borrelli explained that he is not sure about the Alstonville bypass as it is not a Pacific Highway project. He explained that a range of experienced engineers work on the noise modelling to inform design 'up front' and RMS usually finds that modelling is well below the approved levels.

Over the years there has been a different approach now adopted. Many years ago RMS would construct the road and then deal with the noise afterwards. Now RMS undertakes noise mitigation prior to construction so people get the benefit early.

On Pacific Highway projects, we install mitigation measures early, and then we open the new road and measure the results and usually find that we are under the levels. We also undertake post-construction noise modelling to confirm our earlier noise modelling predictions.

I have checked with previous RTA staff and looked back through the records and the environmental documents for the project and no one has advised that a low noise pavement commitment was made nor was I able to find any record. In fact, this issue of the low noise pavement requested was raised prior to the project being approved, and the comments of a number of the residents here tonight are well documented in the representations report for the project. I would be happy after the meeting to sit down with you and step you through that documentation. Our criteria is to comply with noise criteria and noise guidelines.

Question (Khan Silinzieds): Are we likely to be affected by echoes at the tunnel portals? Will there be noise emanating from the tunnel?

Peter Borrelli explained that the noise modelling that has been completed takes into account many things including the terrain, the noise source, if there is a mound or cutting, and the line of sight, for example.

In relation to noise emanating from the tunnel, we won't be constructing anything until it is all worked out.

At the end of the project we come back and monitor noise and find out if there are any exceedences. If there are, then we have to revisit our noise modelling and assessment work.

We work with individuals for noise attenuation e.g. some residents want to retain views and don't want noise mounds. The noise levels have to comply with noise guidelines.

	Question (Jan Hulbert): Is there much noise at the opening of the tunnel? Peter Borrelli explained that yes there will be noise which has been considered in the model; however, the tunnel is in a considerable cutting. Peter added that he's not saying that you won't hear the highway. Question (Donna Jarrett): Why were the seals on the Ballina bypass being replaced so soon? Peter Borrelli explained that sealing has no effect on noise. Concrete has seals because of the cuts in concrete. Comment (Donna Jarrett): In relation to the noise issues, I know as a fact that we were told that because this is a green fields route, it would be built to the best possible standard with the low noise surface. I had conversations with RTA and Arup. That is a conversation that we have had for seven years. That was a sweetener and we were told it would be low noise paving because the road was going through our valley. Comment (Martin Brook): And it makes it very difficult for us. And you are asking us, the community to speed up the progress by giving permission to increase blasting hours of work and vibration limits. Peter Borrelli explained that he has gone back and checked documents and nobody said the road paving would be low noise. The key things are that the noise levels cannot exceed 50dB once the highway is open to traffic. It doesn't make any difference what the surface is; we have to comply with these noise levels. Comment (Donna Jarrett): There is no documentation, and no one was writing down all the questions that we asked. People in this valley have been here for a very long time. It was always peaceful and now that will change. Our valuer has told me that there has already been a report done by Renzo Tonin on a property at Knockrow, and I can get a copy of that report. From what I was told, the modelling was proved wrong; some of the modelling for houses has been wrong by up to 4dB. Peter Borrelli explained that Arup did the initial noise modelling for the concept design, RTA has since done more modelling, and Baulderstone and Hyder are doing more detailed design modelling. Comment (Pam Brook): There was a drill rig being used in the paddock during noise modelling. We are currently discussing this with Baulderstone. Peter Borrelli explained that if there is an issue we'll look at it. Question (Jan Hulbert): You talk about concrete – how are you going to make that less noisy? Peter Borrelli explained that basically when you pour the concrete there are things that you can do to it for skid resistance e.g. we use hessian drag and a transverse grooving machine, which all assist with skid resistance. Controlling the depth of the micro and macro texture controls the noise. Question: Is it right that you have treated properties that are 500 metres away? Peter Borrelli explained that all property treatments have been completed to meet the criteria regardless of their distance away from the road. As a rule the	
--	---	--

	further away the property is from the edge of the road, the lower will be its noise. Question (Khan Silinzieds): What are the noise criteria? We have friends who live in Phoenix Park [around Tintenbar area] and they can hear the noise [from the Ballina bypass] and they are much further away [from the highway] than we are. Peter Borrelli explained that the noise criteria are the same for all road projects and are set by the NSW government. The noise level criteria has been documented in the Environmental Assessment for the project. Question (Martin Brook): Why did the Alstonville bypass have their window thickness set at 10mm and ours is for 6mm? Peter Borrelli explained that he is not sure of specifics of Alstonville. He explained that they might have been treating for higher noise levels. Thicker glass means that we sometimes have to replace the whole window. James O'Connor explained that most of the noise comes through the walls of the house and you can only thicken the glass on windows to a certain extent. The difference between thinner and thicker glass is a couple of decibels. Peter Borrelli added that we would be more than happy to come and have a look at your [Martin Brook] house again if there was a problem there. Comment (Donna Jarrett): It depends on the structure of the house as to how successful the noise attenuation will be. Peter Borrelli added that on other projects when there have been timber framed houses, for example, we have looked at what the most appropriate treatment is for that particular house, and what the particular noise reduction was we needed to achieve. This is done in consultation with property owners to find the treatment that is best for that particular property. Comment (Donna Jarrett): I have had phone calls from a lady at Talofa. She wants to be included in the discussion. She is 700 metres from new highway and RMS has told her that her house is not directly affected. You don't hear people complaining about the stone mastic asphalt (SMA) pavement, but you hear people complaining about the concrete [pavement] all the time. We were told that it would be a low noise pavement and built to the best standard. The cost that you will save from doing the tunnel in a shorter amount of time — can you put that money toward the low noise pavement for the section 2km from Bangalow to the tunnel portal? Comment (Winsome Ormsby): I think you should do the decent thing and do it at the beginning. Peter Borrelli advised that he will take that as a comment. Comment: We've been fighting for this for eight years. Comment (Jan Hulbert): I hope you don't plant hundreds of trees. Peter Borrelli explained that he is happy afterwards to keep discussing this issue, James and I are happy to talk about specific noise levels. Be careful of what you get told. There will be a very detailed presentation about noise levels later in the project so we can answer all these questions. Comment (Pam Brook): We have had advice that we should keep pursuing this. Comment (Martin Brook): We will keep to what we were promised and we	
--	---	--

	are not getting. Comment (Pam Brook): I just don't want to see things happening retrospectively. This road has been happening to us for seven years. We thought the road surface was decided, and we are not noisy like they are in Ewingsdale and we think now it's not too late and we really want to come to a mutually agreeable outcome. Question (Pam Brook): What happens if we don't get signatures – do you still go to the Minister with your application [for increase vibration and overpressure limits and blasting hours]? Peter Borrelli explained that we will still go to the Minister and we will document the consultation that has been done with residents and the feedback received. At the end of the day the Department of Planning and Infrastructure will make a decision as to whether they agree to change the limits for the project or not. Comment (Pam Brook): You can understand why we are sceptical. Comment (Pam Brook): We would really appreciate knowing when the noise monitoring will be going on. We would like to be informed. Comment (Donna Jarrett): We were told about the noise monitoring but we didn't tell Pam and Martin and it doesn't often happen that there was a chainsaw happening every day, but there was when the noise monitoring was occurring. Peter Borrelli explained that we are able to identify if there is a mower or similar in the noise data. James O'Connor added that the noise monitoring is completed over a long period. There is a log and an average is calculated over seven days. Peter Borrelli added that if it rains or there is heavy wind, that data would not be used. We only use data that is credible. Question (Jan Hulbert): Why can't you blast when there is heavy wind? Peter Borrelli explained that overpressure levels would be too great because wind causes overpressure as well. It would be a cumulative effect of overpressure if it is windy as well. Question (Pam Brook): You said there are Ministerial conditions. Why are they set at that level? Peter Borrelli explained that they are a set of generic conditions and not specific to any individual project. Comment (Jan Hulbert): I'd like to thank you all for the time you have put into this. We lost our house to Main Roads 38 years ago, and back then we did not have any of these opportunities to talk to them. We had to do it all through a solicitor and had to fight for everything. I lived up here for six weeks when some RTA people came up here saying they were doing a survey for a new highway. You have put a lot of time into it to talk to people and everybody really appreciates it in the long run. Peter Borrelli thanked everyone, in particular Kevin & Edna Jarrett for the use of the garage for the street meeting, for the opportunity to discuss the project with residents, and extended an offer for anyone to contact him or the community team to discuss further any queries they might have.	
	Meeting closed at 8.49pm.	

Appendix D – Controlled blasting fact sheet

Fact sheet



Transport
Roads & Maritime
Services

MAY 2012

ST HELENA TUNNEL BLASTING WORKS

Roads and Maritime Services, has awarded a contract to Baulderstone Pty Ltd (Baulderstone) to design and construct the Pacific Highway upgrade — Tintenbar to Ewingsdale. This project is jointly funded by the NSW State and Federal Governments. The upgrade will provide approximately 16.3 kilometres of dual carriageway, starting at the northern end of the Ballina bypass at Ross Lane and extending to the Ewingsdale interchange. It is anticipated that substantial construction will commence in mid 2012.

The alignment of the upgrade has been designed to avoid the steep grades of St Helena hill. To achieve this, a tunnel will be constructed through St Helena hill which will also remove the dangerous accident black spot at the top of the hill.

St Helena tunnel features and benefits

- The tunnel is 434 metres in length.
- Two side by side tunnels will be built, each being 19 metres wide with a 10 metre wide rock pillar separating the two tunnels.
- The tunnel is approximately 46 metres below the ridge line.

Background

Controlled tunnel blasting will be required to break up approximately 155,000m³ of high strength basalt rock during construction of the northbound and southbound tunnels through St Helena hill. It is anticipated that controlled blasting in the tunnel is expected to be carried out up to six times per day. Each blast event in the tunnel is expected to take approximately 10 seconds to complete, with the instantaneous blasts in the separate tunnels initiated within a few seconds of each other.

Controlled open cut blasting will also be required to break up the rock at the tunnel portals (entrances) and the tunnel control centre on top of St Helena hill.

The type of controlled tunnel blasting inside the tunnel will differ from controlled 'open cut' blasting that will be undertaken at the tunnel portals and tunnel control centre.

What is controlled tunnel blasting?

Controlled tunnel blasting is a process used in the excavation of tunnels using explosives to break up material in a highly controlled manner that is unable to be practically broken up by traditional mechanical methods. Controlled blasting involves drilling a series of production holes (approximately 45mm in diameter) in a predetermined pattern in the tunnel face.

For each blast there may be in excess of 100 holes drilled. To assist the blast and reduce ground vibration, a number of larger diameter holes known as relief holes are drilled to create a weak zone in the rock face. The blasting holes are then loaded with explosives and set off in a predetermined pattern to break the rock. The blasted material is 'mucked out' from the face by specialised underground loaders and trucks.

What is controlled open cut blasting?

Controlled open cut blasting will be used to excavate the tunnel portals and tunnel control centre with explosives where traditional mechanical methods such as rock hammers are not feasible due to the strength of the rock, the volume of material to be removed and the significant associated noise and vibration impacts to nearby residents. The broken rock will then be excavated and taken away by earthworks equipment.

Why is controlled blasting required?

The St Helena tunnel will connect Ewingsdale to the Tinderbox Valley. Geotechnical investigation and testing has determined that the rock, which is

Pacific Highway upgrade – Tintenbar to Ewingsdale

Reply paid 85913

PO Box 624, BANGALOW NSW 2479

www.rms.nsw.gov.au/pacific

E communityinfo@t2e.com.au T 1800 882 787

This project is funded by the NSW State and Federal Governments.



Transport
Roads & Maritime
Services



'basalt', in the tunnel is of a very high strength. Due to this very high strength rock, it is not suited to mechanical excavation techniques such as roadheaders and will require the use of controlled tunnel blasting to excavate.

When is controlled blasting likely to start?

It is anticipated that controlled open cut blasting at the tunnel portals and the tunnel control centre will start in the second half of 2012, and controlled tunnel blasting will start in late 2012.

How often will controlled tunnel blasting occur?

It is anticipated that there will be a morning and an afternoon blast cycle each day in the St Helena tunnel (up to three blasts in each of the two tunnels per day). This activity will take place over a 12 month period, however, the time taken to complete the tunnel will be largely determined by the geology, strength and condition of the rock that is encountered.

How often will controlled open cut blasting occur?

The controlled blasting at the tunnel portals and the tunnel control centre will involve a maximum of one blast per day, although blasts will not be occurring on a daily basis. Controlled blasting at the tunnel portals will take approximately three months and controlled blasting at the tunnel control centre will take approximately 4 – 6 weeks to complete.

What time will controlled tunnel blasting occur?

Blasting inside the tunnel would occur sometime between 7am and 6pm each day (pending approval of the extension of blasting hours for the tunnel). It is anticipated that there will be one blast period in the morning and a second blast period in the afternoon. Controlled blasting will not take place on Saturdays after 1pm, on Sundays or on public holidays.

What time will controlled open cut blasting occur?

Controlled blasting for the tunnel portals and tunnel control centre will only occur between 9am and 5pm. Controlled blasting will not take place on Saturdays after 1pm or, Sundays or on public holidays.

What are the potential impacts of controlled blasting?

Both open cut and tunnel controlled blasting have a number of potential issues which need to be managed, including:

- Ground vibration i.e. shaking of the ground and objects sitting on it (e.g. structures and buildings).

- Air blast overpressure or noise.
- Dust.
- Scattering of 'fly rock'.

These impacts will be carefully managed by the project team to avoid and or minimise any potential impacts on local residents, and/or motorists. The proposed increased limits would still ensure the comfort and safety of residents during each controlled blast. The blasting limits would be below the level at which any cosmetic damage to structures, such as minor paint cracking, may occur. The vibration from controlled blasts is expected to be very minor beyond the immediate vicinity of the blast zone. Monitoring will be carried out to record noise and vibration for each controlled blast. All blasts will be designed and controlled to ensure that the nominated vibration limits are not exceeded at the nearest sensitive receiver (nearby residents).

There will be minimal dust and no fly rock beyond the immediate vicinity of the blasts at the tunnel, tunnel portals and tunnel control centre.

How do we manage the impacts of controlled blasting?

Significant blast design and modelling work considering the geology of the area, the location and condition of sensitive receivers and vibration and air blast overpressure limits is undertaken. In addition, the project team will prepare a project specific Blast Management Plan and associated work method statements.

Vibration is controlled by adjusting the size and timing of the maximum instantaneous charge (MIC), which is the amount of explosive detonated at any particular instant. The size of the MIC is adjusted so that the limits for ground vibration and air blast overpressure for each sensitive receiver are not exceeded. The size of the MIC is managed by using delays on the detonators so that the controlled blast is set off in a predetermined sequence and by reducing or extending the length of each controlled blast.

The data recovered from the monitoring of each controlled blast, including an initial trial blast, is compared to the predicted effects, to enable the project team to further refine and optimise each blast design.

Noise monitoring will be undertaken initially at the start of any controlled blasting (i.e., at the tunnel portals, in the tunnel and at the tunnel control centre) and subsequently on a monthly basis or

more frequent as may be required to ensure compliance with approved limits and the various management plans for the project, or in response to community complaints. Monitoring to record vibration levels and airblast overpressure will be carried out for each controlled blast. Flashing warning lights attached to vibration monitors, triggered by vibrations in excess of the component Peak Particle Velocity limit for the relevant building type will provide a “real time” visual warning of vibration exceedances. This information will be regularly uploaded to the project website.

Where there is the potential for fly rock, ‘blast mats’ (made of thick shock absorbing rubber) may be used or alternatively the overburden earth material may be kept in place.

What are the vibration and airblast overpressure limits for controlled blasting?

The current approved controlled blasting vibration limits for the tunnel, tunnel portals and tunnel control centre is set at 5 mm/s and 115 dB (Lin Peak) for airblast overpressure and are not to be exceeded for 95% of the controlled blasts.

The project team is currently proposing to increase the vibration limit to 15mm/s and the airblast overpressure limit to 125 dB (Lin Peak) for 95% of the controlled blasts. Increasing the limits will minimise the overall number of blasts, blasting program duration and the extent of rock hammering works in the St Helena Road area. These proposed changes to the vibration and airblast overpressure limits are currently being discussed in consultation with affected residents and require Department of Planning and Infrastructure approval.

What are the blasting mitigation measures?

Affected residents will be informed prior to any controlled blast. Public safety and government guidelines require that all people, vehicles and livestock are a safe distance away from the blast zone. To ensure people are at a safe distance from each blast, mitigation measures may include: -

- Temporary closure of access locations to local roads, and property accesses (residents will be notified in advance).
- Stopping of traffic on St Helena Road for up to 10 minutes and ‘rolling stoppages’ on the Pacific

Highway. These measures will be coordinated to ensure that they have minimal impact on the local community. Provision will be made to ensure that emergency access is maintained during any road closures.

- For safety reasons, some residents within close proximity to controlled blasts may be asked to remain indoors or be temporarily relocated during controlled blasting (open cut blasting only). The community relations team will be in contact with affected residents in advance.

These mitigation measures relate to the controlled open cut blasting only. The controlled tunnel blasting is contained within the tunnel and, as such, it is not envisaged that any specific mitigation measures will be required.

What about the safety of animals and pets during open cut blasting?

It is advisable to keep smaller pets inside during blasting for their safety and wellbeing. Animals in paddocks should be checked before and after controlled blasting. The community relations team will provide specific timing details to those residents with nearby animals in paddocks on an individual basis.

What should I do if I have valuables and antiques in my house?

Whilst there should be no discernable impact for most residents from the blasting operations, it may be advisable, as a precautionary measure, to remove any valuables and antiques from shelves or walls during the controlled blasting works. The project team will be available to inspect individual properties and provide additional guidance on this matter on a case by case basis.

What should I do if I think my house has been damaged?

In the unlikely event that any damage is sustained to your property during the blasting process please contact the Community Relations Manager immediately on 1800 882 787 (free call). The project team will organise to have the damage inspected and will monitor your dwelling during future blasts to determine if the controlled blasting has caused the damage. Any damage sustained as a result of the controlled blasting works will be rectified.

Appendix E – ERG Member Agency comments on draft report

MOSS Jade M

From: Anthony Acret [Anthony.Acret@rouswater.nsw.gov.au]
Sent: Thursday, 28 March 2013 11:34 AM
To: BORRELLI Peter
Cc: Records
Subject: RE: Pacific Highway Upgrade - Tintenbar to Ewingsdale

Hi Peter,

Thank you for your email and the opportunity to review the environmental assessment for the St Helena Tunnel Control Centre. Rous Water has reviewed the environmental assessment and has no comments related to environmental assessment issues.

Best regards

Anthony Acret

Anthony Acret
 Catchment Assets Manager
 Rous Water
 PO Box 230
 LISMORE NSW 2480
 Tel: (02) 6621 8055
 Fax: (02) 6622 1181

[Tara – File = 1577]

From: peter.borrelli@rms.nsw.gov.au [mailto:peter.borrelli@rms.nsw.gov.au]
Sent: Wednesday, 20 March 2013 6:03 PM
To: craig.dunk@epa.nsw.gov.au; robert.donohoe@epa.nsw.gov.au; james.sakker@industry.nsw.gov.au; michael.king@byron.nsw.gov.au; Anthony Acret
Cc: mark.woods@rms.nsw.gov.au; claire.everett@rms.nsw.gov.au; jade.moss@rms.nsw.gov.au
Subject: Pacific Highway Upgrade - Tintenbar to Ewingsdale

All,

As you would be aware we are rapidly progressing with the implementation of the Pacific Highway Upgrade - Tintenbar to Ewingsdale.

A key component of the the project is the Tunnel Control Centre (TCC) which is used to house and control a range of essential fire and life safety systems for the 434m long St Helena Tunnel. The TCC is primarily an unmanned facility which would only be utilised during planned maintenance activities (expected quarterly) and major incidents in the tunnel requiring the on site operation / control of the fire and life safety systems.

To ensure that we have covered off on all bases we have agreed with DoPI to prepare an Environmental Assessment document. We are now distributing a draft to each of the ERG agency representatives for review and comment prior to finalising the document.

Given the current status of the project this is very urgent and we are seeking a very quick turn around

10/04/2013

on this document. It is not a big document, and I don't think there are any surprises here for anyone as we have previously covered off on this in the CEMP for the project and various ERG presentations. We are seeking any comments you might have by 27 March 2013. If this timeframe represents a difficulty for anyone, please let me know and Mark and I will try and assist with work priorities. If you have no comments please feel free to let me know that also so we can record that also.

Sorry for the large file transfer format I had to do this because of the size of the document.

Please note this is a Roads and Maritime (RMS) project matter which we are looking after directly and independently of our construction contractor. If you have any queries, comments or concerns please feel free to call me directly on 0407 254 363.

Thanks

Peter Borrelli
Senior Project Manager, Strategic Projects
20 March 2013

File(s) will be available for download until **27 March 2013**:

File: [Tunnel Control Centre EA Final Draft 200313_1.pdf](#), 7,833.40 KB [[Fingerprint: ce81b6b78c2f4b55fdea8a1ee2162a2c](#)]

You have received attachment link(s) within this email sent via the Roads and Maritime Services - Accellion Secure File Transfer. To retrieve the attachment(s), please click on the link(s).

[Accellion File Transfer](#)



Before printing, please consider the environment

IMPORTANT NOTICE: This e-mail and any attachment to it are intended only to be read or used by the named addressee. It is confidential and may contain legally privileged information. No confidentiality or privilege is waived or lost by any mistaken transmission to you. Roads and Maritime Services (RMS) is not responsible for any unauthorised alterations to this e-mail or attachment to it. Views expressed in this message are those of the individual sender, and are not necessarily the views of RMS. If you receive this e-mail in error, please immediately delete it from your system and notify the sender. You must not disclose, copy or use any part of this e-mail if you are not the intended recipient.

DISCLAIMER

This email including any attachment is intended solely for the named addressee. Any views or opinions expressed in this email are solely those of the author and do not necessarily represent the view or opinion of Council. Confidentiality or legal privilege is not waived or lost simply because this email was sent in error. If you have however received this email in error please immediately notify the sender and destroy the email and any copy you may have of it. Council recommends that you check for the presence of viruses before opening any attachment to this email. Council does not accept liability for any damage caused by a virus transmitted by emails from it.

[Click here for information about Councils Privacy Management Plan](#)

Rous Water | Richmond River County Council | Far North Coast Weeds
218-232 Molesworth Street
Lismore NSW 2480
Australia

MOSS Jade M

From: Craig Dunk [Craig.Dunk@epa.nsw.gov.au]
Sent: Tuesday, 26 March 2013 5:47 PM
To: BORRELLI Peter; Robert Donohoe; james.sakker@industry.nsw.gov.au; michael.king@byron.nsw.gov.au; anthony.acret@rouswater.nsw.gov.au
Cc: WOODS Mark; EVERETT Claire; MOSS Jade M
Subject: RE: Pacific Highway Ugrade - Tintenbar to Ewingsdale

Hi Peter,

The EPA appreciates the opportunity to review the modification document (dated March 2013) drafted and submitted to agencies in relation to the St Helena Tunnel Control Centre.

The EPA has reviewed the document and has no comments at this time.

Regards

Craig Dunk

Regional operations Officer | **NSW Environment Protection Authority** |

☎: (02) 6640 2514 | Mobile ☎: 0427 237 154 | 📠: (02) 6640 2539 | ✉: Craig.Dunk@epa.nsw.gov.au

From: peter.borrelli@rms.nsw.gov.au [mailto:peter.borrelli@rms.nsw.gov.au]
Sent: Wednesday, 20 March 2013 6:03 PM
To: Dunk Craig; Donohoe Robert; james.sakker@industry.nsw.gov.au; michael.king@byron.nsw.gov.au; anthony.acret@rouswater.nsw.gov.au
Cc: mark.woods@rms.nsw.gov.au; claire.everett@rms.nsw.gov.au; jade.moss@rms.nsw.gov.au
Subject: Pacific Highway Ugrade - Tintenbar to Ewingsdale

All,

As you would be aware we are rapidly progressing with the implementation of the Pacific Highway Upgrade - Tintenbar to Ewingsdale.

A key component of the the project is the Tunnel Control Centre (TCC) which is used to house and control a range of essential fire and life safety systems for the 434m long St Helena Tunnel. The TCC is primarily an unmanned facility which would only be utilised during planned maintenance activities (expected quarterly) and major incidents in the tunnel requiring the on site operation / control of the fire and life safety systems.

To ensure that we have covered off on all bases we have agreed with DoPI to prepare an Environmental Assessment document. We are now distributing a draft to each of the ERG agency representatives for review and comment prior to finalising the document.

Given the current status of the project this is very urgent and we are seeking a very quick turn around on this document. It is not a big document, and I don't think there are any surprises here for anyone as we have previously covered off on this in the CEMP for the project and various ERG presentations. We are seeking any comments you might have by 27 March 2013. If this timeframe represents a difficulty for anyone, please let me know and Mark and I will try and assist with work priorities. If you have no comments please feel free to let me know that also so we can record that also.

Sorry for the large file transfer format I had to do this because of the size of the document.

Please note this is a Roads and Maritime (RMS) project matter which we are looking after directly

and independently of our construction contractor. If you have any queries, comments or concerns please feel free to call me directly on 0407 254 363.

Thanks

Peter Borrelli
Senior Project Manager, Strategic Projects
20 March 2013

File(s) will be available for download until **27 March 2013**:

File: [Tunnel Control Centre EA Final Draft 200313_1.pdf](#), 7,833.40 KB [Fingerprint: ce81b6b78c2f4b55fdea8a1ee2162a2c]

You have received attachment link(s) within this email sent via the Roads and Maritime Services - Accellion Secure File Transfer. To retrieve the attachment(s), please click on the link(s).

[Accellion File Transfer](#)



Before printing, please consider the environment

IMPORTANT NOTICE: This e-mail and any attachment to it are intended only to be read or used by the named addressee. It is confidential and may contain legally privileged information. No confidentiality or privilege is waived or lost by any mistaken transmission to you. Roads and Maritime Services (RMS) is not responsible for any unauthorised alterations to this e-mail or attachment to it. Views expressed in this message are those of the individual sender, and are not necessarily the views of RMS. If you receive this e-mail in error, please immediately delete it from your system and notify the sender. You must not disclose, copy or use any part of this e-mail if you are not the intended recipient.

This email is intended for the addressee(s) named and may contain confidential and/or privileged information.

If you are not the intended recipient, please notify the sender and then delete it immediately.
Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the Environment Protection Authority.

PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

MOSS Jade M

From: james.sakker@dpi.nsw.gov.au
Sent: Saturday, 23 March 2013 11:49 AM
To: BORRELLI Peter
Subject: Re: Pacific Highway Upgrade - Tintenbar to Ewingsdale

NSW DPI have no comment to make on the Tunnel Control Centre EA
 regards james

James Sakker Conservation Manager (Pacific Highway Upgrade) Department of Primary Industries NSW (NSW DPI) 1243 Bruxner Highway
 Wollongbar NSW 2477
 M 0419 185378 F 02 66283264
 james.sakker@industry.nsw.gov.au

-----<peter.borrelli@rms.nsw.gov.au> wrote: -----

To: <craig.dunk@epa.nsw.gov.au>, <robert.donohoe@epa.nsw.gov.au>, <james.sakker@industry.nsw.gov.au>, <michael.king@byron.nsw.gov.au>, <anthony.acret@rouswater.nsw.gov.au>
 From: <peter.borrelli@rms.nsw.gov.au>
 Date: 03/20/2013 06:02PM
 Cc: <mark.woods@rms.nsw.gov.au>, <claire.everett@rms.nsw.gov.au>, <jade.moss@rms.nsw.gov.au>
 Subject: Pacific Highway Upgrade - Tintenbar to Ewingsdale

All,

As you would be aware we are rapidly progressing with the implementation of the Pacific Highway Upgrade - Tintenbar to Ewingsdale.

A key component of the the project is the Tunnel Control Centre (TCC) which is used to house and control a range of essential fire and life safety systems for the 434m long St Helena Tunnel. The TCC is primarily an unmanned facility which would only be utilised during planned maintenance activities (expected quarterly) and major incidents in the tunnel requiring the on site operation / control of the fire and life safety systems.

To ensure that we have covered off on all bases we have agreed with DoPI to prepare an Environmental Assessment document. We are now distributing a draft to each of the ERG agency representatives for review and comment prior to finalising the document.

Given the current status of the project this is very urgent and we are seeking a very quick turn around on this document. It is not a big document, and I don't think there are any surprises here for anyone as we have previously covered off on this in the CEMP for the project and various ERG presentations. We are seeking any comments you might have by 27 March 2013. If this timeframe represents a difficulty for anyone, please let me know and Mark and I will try and assist with work priorities. If you have no comments please feel free to let me know that also so we can record that also.

Sorry for the large file transfer format I had to do this because of the size of the document.

Please note this is a Roads and Maritime (RMS) project matter which we are looking after directly and independently of our construction contractor. If you have any queries, comments or concerns please feel free to call me directly on 0407 254 363.

Thanks

Peter Borrelli
 Senior Project Manager, Strategic Projects
 20 March 2013

File(s) will be available for download until **27 March 2013** :

File: [Tunnel Control Centre EA Final Draft 200313_1.pdf](#), 7,833.40 KB [[Fingerprint](#): ce81b6b78c2f4b55fdea8a1ee2162a2c]

You have received attachment link(s) within this email sent via the Roads and Maritime Services - Accellion Secure File Transfer. To retrieve the attachment(s), please click on the link(s).

[Accellion File Transfer](#)



Before printing, please consider the environment

IMPORTANT NOTICE: This e-mail and any attachment to it are intended only to be read or used by the named addressee. It is confidential and may contain legally privileged information. No confidentiality or privilege is waived or lost by any mistaken transmission to you. Roads and Maritime Services (RMS) is not responsible for any unauthorised alterations to this e-mail or attachment to it. Views expressed in this message are those of the individual sender, and are not necessarily the views of RMS. If you receive this e-mail in error, please immediately delete it from your system and notify the sender. You must not disclose, copy or use any part of this e-mail if you are not the intended recipient.

This message is intended for the addressee named and may contain confidential information.
 If you are not the intended recipient, please delete it and notify the sender.
 Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

MOSS Jade M

From: King, Michael [Michael.King@byron.nsw.gov.au]
Sent: Thursday, 28 March 2013 12:26 PM
To: BORRELLI Peter
Subject: RE: Pacific Highway Upgrade - Tintenbar to Ewingsdale

Peter

The draft document at a glance looks OK and no further comments are made.

Thanks

Michael King

Manager Infrastructure Planning

02 6626 7026

michael.king@byron.nsw.gov.au

**Community Infrastructure
 Byron Shire Council
 PO Box 219 MULLUMBIMBY NSW 2482**

From: peter.borrelli@rms.nsw.gov.au [mailto:peter.borrelli@rms.nsw.gov.au]
Sent: Thursday, 28 March 2013 11:55 AM
To: King, Michael
Subject: Pacific Highway Upgrade - Tintenbar to Ewingsdale

Michael,

Re-send of E-Mail from 20 March 2013.

As you would be aware we are rapidly porgressing with the implementation of the Pacific Highway Upgrade - Tintenbar to Ewingsdale.

A key component of the the project is the Tunnel Control Centre (TCC) which is used to house and control a range of essential fire and life safety systems for the 434m long St Helena Tunnel. The TCC is primarily an unmanned facility which would only be utilised during planned maintenance activies (expected quarterly) and major incidents in the tunnel requiring the on site operation / control of the fire and life safety systems.

To ensure that we have covered off on all bases we have agreed with DoPI to prepare an Environmental Assessment document. We are now distributing a draft to each of the ERG agency representatives for review and comment prior to finalising the document.

Given the current status of the project this is very urgent and we are seeking a very quick turn around on this document. It is not a big document, and I don't think there are any surprises here for anyone as we have previously covered off on this in the CEMP for the project and various ERG presentations. We are seeking any comments you might have by 27 March 2013. If this timeframe represents a difficulty for anyone, please let me know and Mark and I will try and assist with work priorities. If you have no comments please feel free to let me know that also so we can record that also.

Sorry for the large file transfer format I had to do this because of the size of the document.

10/04/2013

Please note this is a Roads and Maritime (RMS) project matter which we are looking after directly and independently of our construction contractor. If you have any queries, comments or concerns please feel free to call me directly on 0407 254 363.

Thanks

Peter Borrelli
Senior Project Manager, Strategic Projects
28 March 2013

File(s) will be available for download until **04 April 2013**:

File: [Tunnel Control Centre EA Final Draft 200313_1.pdf](#), 7,833.40 KB [Fingerprint: ce81b6b78c2f4b55fdea8a1ee2162a2c]

You have received attachment link(s) within this email sent via the Roads and Maritime Services - Accellion Secure File Transfer. To retrieve the attachment(s), please click on the link(s).

[Accellion File Transfer](#)



Before printing, please consider the environment

IMPORTANT NOTICE: This e-mail and any attachment to it are intended only to be read or used by the named addressee. It is confidential and may contain legally privileged information. No confidentiality or privilege is waived or lost by any mistaken transmission to you. Roads and Maritime Services (RMS) is not responsible for any unauthorised alterations to this e-mail or attachment to it. Views expressed in this message are those of the individual sender, and are not necessarily the views of RMS. If you receive this e-mail in error, please immediately delete it from your system and notify the sender. You must not disclose, copy or use any part of this e-mail if you are not the intended recipient.

Appendix F – RCA Australia 2011 Site contamination assessment



Geotechnical Engineering

Engineering Geology

Hydrogeology

Contaminated Site Assessment

Construction Materials Testing

Environmental Monitoring

FACTUAL REPORT ENVIRONMENTAL SITE INVESTIGATION TINTENBAR TO EWINGSDALE PACIFIC HIGHWAY UPGRADE

BANANA PLANTATION CHAINAGE 28100 - 28500

**Prepared for
AURECON**

**On behalf of

RTA**

**Prepared by
RCA AUSTRALIA**

RCA ref 7534a-804/1

APRIL 2011

RCA AUSTRALIA

ABN 53 063 515 711

92 Hill Street, CARRINGTON NSW 2294

Telephone: +61 2 4902 9200

Facsimile: +61 2 4902 9299

Email: administrator@rca.com.auInternet: www.rca.com.au

This document is and shall remain the property of RCA Australia. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

DOCUMENT STATUS						
Rev No	Comment	Author	Reviewer	Approved for Issue (Project Manager)		
				Name	Signature	Date
/0	Final	F Brooker	D Johnson	F Brooker		12.04.11
/1	Revised with additional results	F Brooker	D Johnson	F Brooker		20.04.11

DOCUMENT DISTRIBUTION				
Rev No	Copies	Format	Issued to	Date
/0	1	Electronic (email)	Aurecon – Charlie Shackell – ShackellC@ap.aurecongroup.com	12.04.11
/0	1	Electronic report	RCA – job archive	12.04.11
/1	1	Electronic (email)	Aurecon – Charlie Shackell – ShackellC@ap.aurecongroup.com	20.04.11
/1	1	Electronic report	RCA – job archive	20.04.11

Contents

1	INTRODUCTION	1
2	SITE DESCRIPTION AND LOCATION	2
3	FIELDWORK.....	2
4	SITE GUIDELINES	2
4.1	SOIL.....	2
4.1.1	NEPM – NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE (1999).....	3
4.1.2	GUIDELINES FOR ASSESSING BANANA PLANTATION SITES.....	3
4.2	APPROPRIATENESS OF THE GUIDELINES	3
5	RESULTS.....	4
6	LIMITATIONS	4
	REFERENCES	5
	GLOSSARY.....	5

APPENDIX A

DRAWING

APPENDIX B

FIELD SHEETS

APPENDIX C

EXPOSURE SCENARIOS

APPENDIX D

SUMMARY OF SOIL RESULTS

RCA ref 7534a-804/1



20 April 2011

Aurecon
116 Military Road
NEUTRAL BAY NSW 2089

Attention: Charlie Shackell

Geotechnical Engineering
Engineering Geology
Environmental Engineering
Hydrogeology
Construction Materials Testing

FACTUAL REPORT
ENVIRONMENTAL SITE INVESTIGATION
BANANA PLANTATION CHAINAGE 28100 - 28500
PACIFIC HIGHWAY UPGRADE TINTENBAR TO EWINGSDALE

1 INTRODUCTION

This report presents the findings of an environmental assessment of a banana plantation in the acquisition area of the Pacific Highway upgrade, Tintenbar to Ewingsdale. This assessment was requested following the completion of an environmental assessment along the proposed Pacific Highway route due to alterations in operation requirements. This site is now proposed to be used as a construction compound and there will be substantial soil disturbance. Following the completion of the highway construction it is understood that this site will be landscaped and then left vacant.

This assessment was originally to include assessment of pathogens related to the presence of a banana plantation on the site. However, following advice from the Queensland Department of Agriculture and Science, it was determined that this testing would not be required due to:

- the understanding that no plant materials will be removed from the site; and
- that there is no way to validate a site as being free of biological pathogens.

RCA Australia (RCA), upon the advice of the Department, presumed that the biological pathogens were present and undertook decontamination of all equipment and personnel engaged in the sampling works.

2 SITE DESCRIPTION AND LOCATION

The site is described as the G Singh property and is situated between chainages 28100 and 28500. Approximately 3.65ha of the site have been acquired by the RTA for the purpose of the Pacific Highway upgrade. The location of the site and the acquired area are shown on **Drawing 1, Appendix A**.

3 FIELDWORK

Due to timing requirements sampling was undertaken by a geotechnical engineer engaged in works associated with the Pacific Highway upgrade on 18 and 21 March 2011.

The scope of work was based on Table A of the Guidelines for Assessing Banana Plantation Sites (Ref [1]) which specifies sixteen (16) sample locations per hectare equivalent to a 25m square grid pattern. Based on an area 3.65 this was calculated to be 59 samples, and RCA rounded this to 60 to enable the use of composite samples.

An approximate grid was derived for the site and sixty (60) soil samples were collected by hand tools from between 0.1 and 0.4m below the surface. This methodology would have resulted in disturbed samples, however given the semi and low volatile nature of the contaminants of concern, this is not considered to be an issue.

No evidence of contamination, olfactory or visual, was identified. The soil strata identified comprised predominantly clayey silt, brown to red brown, with some areas including higher proportions of clay and some minor proportions of gravel.

Decontamination of the sampling equipment was undertaken by brushing of excess soil from the sampling equipment between samples. Decontamination of all equipment (including esky) and personnel was undertaken by washing in Castrol *Farmcleanse* and potable water in accordance with the recommended process.

Field Sheets are attached in **Appendix B** and the location of the discrete samples is shown on **Drawing 1, Appendix A**.

The discrete samples were composited in groups of four (4) based on proximity only, due to the overall homogeneity of the material.

4 SITE GUIDELINES

4.1 SOIL

Due to the use of composite samples, RCA has adjusted the criteria from the following references by dividing by the number of discrete samples. This is in accordance with industry practice. Where analysis of discrete samples was undertaken, the guideline criteria have not been adjusted.

4.1.1 NEPM – NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE (1999)

The guidelines used for the assessment of the soil on site were sourced from the National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 1999 (Ref [2]). Schedule B(1) of this measure provides a table for the investigation concentrations for contaminants based on human health risk and certain exposure scenarios due to site use.

Based on the proposed redevelopment of the corridor for use as a highway RCA considers the following guidelines to be appropriate for site assessment:

- HIL 'F' - Commercial/industrial, no poultry, no fruit or vegetable consumption, no groundwater consumption: includes premises such as shops and offices as well as factories and industrial sites. Thirty years is the assumed duration of exposure.

Refer to **Appendix C** for a copy of the exposure scenarios for the derivation of the above guidelines.

4.1.2 GUIDELINES FOR ASSESSING BANANA PLANTATION SITES

These guidelines were used to determine the scope of assessment required at the site. Table B in the guidelines presents criteria for the investigation thresholds for sample results. The criteria provided are:

- Arsenic – 100mg/kg;
- Lead – 300mg/kg;
- DDT – 50mg/kg;
- Aldrin/Dieldrin – 10mg/kg.

RCA notes that these concentrations are equivalent to the concentrations of the HIL 'A' (residential) criteria of the NEPM (Ref [2]).

4.2 APPROPRIATENESS OF THE GUIDELINES

The NEPM (Ref [2]) document has been approved by the NSW EPA for use on potentially contaminated sites and supersedes most of the preceding reference documents. The Banana Plantation Guidelines (Ref [1]) have been written especially for assessment of these sites.

RCA considers that due to the proposed use of the site as a construction compound and, later as a landscaped and vacant portion of land over a tunnel, that the threshold criteria in the banana guidelines (Ref [1]) are unnecessarily stringent. The HIL 'F' guidelines from the NEPM are considered to be more relevant to the long-term use.

5 RESULTS

All soil and groundwater results are compared to the relevant guidelines in **Appendix D**. In summary:

- All arsenic results were within the adjusted HIL 'F' criterion, however eight (8) samples were in excess of the adjusted HIL 'A' criterion, including two which were greater than 250% of the adjusted HIL 'A' criterion.
- Additional analysis of thirty two (32) discrete samples from the above eight (8) composites indicated three (3) samples with concentrations in excess of the HIL 'A' criterion. No samples were in excess of the HIL 'F' criterion.
- All lead results were within the adjusted HIL 'F' and HIL 'A' criteria.
- No OCP were detected in any sample, within both the HIL 'F' and HIL 'A' criteria for those compounds with guidelines.

6 LIMITATIONS

This report has been prepared for Aurecon Group on behalf of the Roads and Traffic Management Authority in accordance with an agreement with RCA. The services performed by RCA have been conducted in a manner consistent with that generally exercised by members of its profession and consulting practice.

This report has been prepared for the sole use of Aurecon Group on behalf of the Roads and Traffic Management Authority. The report may not contain sufficient information for purposes of other uses or for parties other than Aurecon Group on behalf of the Roads and Traffic Management Authority as it relates to the Tintenbar to Ewingsdale Pacific Highway Upgrade. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. Conditions can vary across any site that cannot be explicitly defined by investigation.

Environmental conditions including contaminant concentrations can change in a limited period of time. This should be considered if the report is used following a significant period of time after the date of issue.

Yours faithfully

RCA AUSTRALIA



Fiona Brooker
Associate Environmental Engineer



David Johnson
Principal Environmental Engineer

REFERENCES

- [1] NSW EPA, *Guidelines for Assessing Banana Plantation Sites*, October 1997.
- [2] NEPC, *National Environment Protection (Assessment of Site Contamination) Measure*, 1999.

GLOSSARY

HIL 'A'	Standard Residential Health Based Investigation Level, pg 9 Schedule B1, <i>National Environment Protection (Assessment of Site Contamination) Measure</i> .
HIL 'F'	Commercial/industrial Health Based Investigation Levels, pg 9 Schedule B1 <i>National Environment Protection (Assessment of Site Contamination) Measure</i> .
Hotspot	A sample, or location, where contaminant concentrations exceed 250% of the appropriate guideline.
NEPM	National Environment Protection Measure.
Pathogen	An organism capable of causing disease.
PQL	Practical Quantitation Limit.
QA	Quality Assurance.
QC	Quality Control.
RPD	Relative Percentage Difference.

Chemical Compounds

OCPs	Organochlorin Pesticides.
------	---------------------------

Appendix A

Drawing

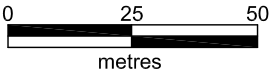


Locality Plan
N.T.S

LEGEND

- RCA hand auger samples
- Acquisition boundary

NOTE: Drawing adapted from plans supplied by ARUP, Dwg 0101-8406 to 0127-8406 General Arrangement Plan Sheet 1 to 27 Aerial image taken from Google Earth, November 12 2006



SOIL SAMPLE LOCATION PLAN
G. SINGH BANANA PLANTATION
TINTENBAR TO EWINGSDALE

CLIENT RTA		RCA Ref 7534a-804/1	
DRAWN BY	PC	SCALE 1 : 1500 (A3)	DRAWING No 1 REV 0
APPROVED BY	FB	DATE 20/4/2011	OFFICE NEWCASTLE

Appendix B

Field Sheets

Handwritten signature

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: RCA/RTA
PROJECT: TRE
LOCATION: St Helena - Singh Property
PROJECT MANAGER: FB

DATE: 18/3/2011
PROJECT No: 75349
CLIENT REF: 44219

Handwritten note: taken by [unclear]

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
GS1	St Helena - Singh	0.2-0.3		GS	Clayey SILT, dark brown.		
GS2		0.1-0.2			" "		
GS3		0.2-0.3			Clayey SILT, Brown/red.		
GS4		0.3-0.4			" "		
GS5		0.1-0.2			Clayey SILT, Dark Brown		
GS6		0.2-0.3			" "		
GS7		0.3-0.4			Clayey SILT, BROWN		
GS8		0.1-0.2			" "		
GS9		0.2-0.3			Clayey SILT, RED BROWN.		
GS10	GSQA1	0.1-0.2			" "		
GS11		0.3-0.4			" "		
GS12		0.2-0.3			Clayey SILT, dark BROWN.		

RCA Australia	Sampled by: <u>PC</u>	Date: <u>18/3/2011</u>
Office:	Checked by:	Date:

GS = Glass Jar

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
GS13	St Helena - Singh	0.1-0.2			Clayey SILT, brown		
GS14	↓	0.3-0.4			Clayey SILT, dark brown.		
GS15	↓	0.2-0.3			Clayey SILT w gravel, brown.		
GS16	↓	0.3-0.4			Gravelly Clayey SILT, dark brown		
GS17	↓	0.2-0.3			" "		
GS18	↓	0.3-0.4			" "		
GS19	↓	0.1-0.2			Clayey SILT, brown		
GS20	GSQA2.	0.2-0.3			" "		
GS21	↓	0.1-0.2			Gravelly SILT, brown.		
GS22	↓	0.2-0.3			Clayey SILT, brown/red.		
GS23	↓	0.1-0.2			Clayey SILT, brown/red.		
GS24	↓	0.3-0.4			Silty CLAY, brown.		

RCA Australia	Sampled by: PC	Date: 18/3/2011
Office:	Checked by:	Date:

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: RCA/ATA
 PROJECT: T2E
 LOCATION: St Helena - Singh Property
 PROJECT MANAGER: FB

DATE: 21/3/2011
 PROJECT No: 7534a
 CLIENT REF: 44219

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
GS25	Clayey SILT w/ Gravel	0.1-0.2		GS	Singh Property		
GS26	Singh Property	0.2-0.3			Gravelly Clayey SILT, dark brown		
GS27		0.3-0.4			Clayey SILT, MP, dark brown.		
GS28		0.2-0.3			Silty CLAY, MP, dark brown		
GS29		0.2-0.3			Clayey SILT, w/ gravel, brown		
GS30	GSQA3	0.1-0.2			Gravelly Clayey SILT, brown		
GS31		0.2-0.3			Gravelly SILT, dark brown.		
GS32		0.3-0.4			Silty CLAY, MP, brown/red.		
GS33		0.3-0.4			Clayey SILT, MP, brown.		
GS34		0.2-0.3			Silty CLAY, MP, brown/red.		
GS35		0.1-0.2			Gravelly Clayey SILT, brown		
GS36		0.2-0.3			Clayey SILT, brown/red.		

RCA Australia	Sampled by: <u>Paul Crozer</u>	Date: <u>21/3/2011</u>
Office:	Checked by:	Date:

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
GS37	Singh Property - St Helena GSQK4 GSQK5	0.1-0.2		GS	Gravelly SILT, brown		
GS38		0.1-0.2			" "		
GS39		0.3-0.4			Clayey SILT, MP, brown		
GS40		0.2-0.3			Clayey SILT, brown		
GS41		0.3-0.4			Clayey SILT, MP, dark brown		
GS42		0.2-0.3			Clayey SILT, brown		
GS43		0.3-0.4			" "		
GS44		0.1-0.2			Gravelly Clayey SILT		
GS45		0.2-0.3			Silty CLAY, MP, brown		
GS46		0.2-0.3			Clay Silty, MP, brown/black. ~ organic matter high		
GS47		0.3-0.4			Clayey SILT, MP brown		
GS48		0.1-0.2			Clayey SILT, dark brown		
GS49		0.2-0.3			Silty CLAY, MP/HP, brown		
GS50		0.3-0.4			Silty CLAY, MP, brown		
GS51		0.1-0.2			Clayey SILT, dark brown		
GS52		0.1-0.2			" "		
GS53		0.2-0.3			" "		

GSz Glass Jar.

RCA Australia	Sampled by:	Date:
Office:	Checked by:	Date:

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: LCA/RTA
 PROJECT: TZE
 LOCATION: St Helena - Single Property
 PROJECT MANAGER: FB

DATE: 21/3/2011
 PROJECT No: 1534a
 CLIENT REF: 44219

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
G554		0.3-0.4		GJ	Silly CLAY, brown/red		
G555		0.2-0.3			Clayey SILT, brown		
G556		0.2-0.3			Clayey SILT, dark brown		
G557		0.1-0.2			Clayey SILT, brown/red		
G558		0.2-0.3			Clayey SILT, w gravel, (brown)		
G559		0.2-0.3			Clayey SILT, brown.		
G560	G5QA6	0.1-0.2			Clayey SILT, dark brown.		
G5QB2							

RCA Australia	Sampled by: <u>PC</u>	Date: <u>21/3/2011</u>
Office:	Checked by:	Date:

Appendix C

Exposure Scenarios

Table 6-A
A. 'STANDARD' RESIDENTIAL - minimal home food production

Default Exposure Ratio:	1.0 (the 'base case')
Exposure Period:	24 hours/day 365 days/year 70 years' occupancy duration
Assumptions:	Residential garden and soil accessible Less than 10% of intake of fruit and vegetables derives from garden Refer Langley & Sabordo (1996) for specific exposure factors
Exclusions:	On-site Poultry Groundwater consumption Volatile contaminants, unless already accounted for in setting HIL for that contaminant
Direct Soil Exposure Pathways:	Direct soil and dust ingestion (Table 6.2, ANZECC/ NHMRC 1992) Direct soil dermal contact Direct soil particulate inhalation
Indirect Soil Exposure Pathways:	Uptake into and consumption of home-grown fruit and vegetables (limited)

Table 6-F
F. COMMERCIAL/INDUSTRIAL LAND USE

Default Exposure Ratio:	0.2
Exposure Period:	8 hours/day 5 days/week 48 weeks/year 30 years' duration
Assumptions:	Soil contact opportunities arise during course of site utilisation by public and workers. Adults will usually be the key exposure concern allowing a lower default exposure ratio than for Parklands/Recreational Land Use. No residential land use occurring.(NB creches and day-care centres belong in category A). Refer Langley & Sabordo (1996) for specific exposure factors
Exclusions:	Home-grown fruit, vegetables, poultry etc. Groundwater consumption Volatile contaminants, unless already accounted for in setting HIL for that contaminant
Direct Soil Exposure Pathways:	Direct soil ingestion Direct soil dermal contact Direct soil particulate inhalation
Indirect Soil Exposure Pathways:	Nil applicable

Appendix D

Summary of Soil Results

Sample Identification		PQL	Composite Adjusted Guideline		Composite 1	Composite 2	Composite 3	Composite 4	Composite 5	Composite 6	Composite 7	Composite 8	Composite 9	Composite 10	Composite 11	Composite 12	Composite 13	Composite 14	Composite 15
Discrete Samples					GS1, GS2, GS3, GS22	GS4, GS5, GS20, GS21	GS6, GS7, GS18, GS19	GS8, GS9, GS16, GS17	GS10, GS11, GS14, GS15	GS12, GS13, GS30, GS31	GS28, GS29, GS34, GS35	GS26, GS27, GS36, GS37	GS23, GS24, GS25, GS38	GS39, GS40, GS48, GS49	GS41, GS42, GS46, GS47	GS32, GS33, GS43, GS44	GS45, GS50, GS51, GS52	GS53, GS54, GS55, GS56	GS57, GS58, GS59, GS60
Sample Depth (m)			HIL 'A' ^{AB}	HIL 'F' ^A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date					18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18&21/03/2011	21/3/11	21/3/11	18&21/03/2011	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11
Sample Purpose					Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation
Sample collected by					PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Metals																			
Arsenic	1	25	125	6.7	15	24	38	29	66	63	34	54	59	28	9.5	24	3.8	3.2	
Lead	2	75	375	9.8	8.1	8.7	6	5.9	9.1	5	6.5	7.8	8.2	7.3	5.4	10	10	20	
Organochlorine Pesticides (OCP)																			
alpha-BHC	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
HCB	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
b-BHC	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
g-BHC (Lindane)	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
d-BHC	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Heptachlor	0.05	2.5	12.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Aldrin	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Heptachlor epoxide	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Chlordane - trans	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Endosulfan 1	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Chlordane - cis	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Dieldrin	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
DDE	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Endrin	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Endosulfan 2	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
DDD	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Endosulfan sulfate	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
DDT	0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Methoxychlor	0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Endrin aldehyde	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Endrin ketone	0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
DDT+DDD+DDE	0.3	50	250	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>	
Aldrin + Dieldrin	0.1	2.5	12.5	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	
Chlordane	0.1	12.5	62.5	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	<u>0.05</u>	

All results are in units of mg/kg.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit.

^A NEPM 1999 HIL 'A' (Residential), HIL 'F' (Commercial/Industrial)

^B NSW EPA 1997 Table B Human health investigation thresholds - arsenic, lead, DDT and aldrin+ dieldrin only

All guidelines have been divided by four (4) to allow comparison with the composite samples

Results shown in shading are in excess of the primary acceptance criteria: HIL F

Results shown in *italics* are in excess of the secondary acceptance criteria: HIL A

Results shown in **BOLD** are >250%of the secondary acceptance criteria: HIL A

Where summation required (OCP) calculation includes components reported as non detected as 1/2 PQL. Underlined summations are those not detected

Sample Identification	PQL	Guideline		GS8	GS9	GS16	GS17	GS10	GS11	GS14	GS15	GS12	GS13	GS30	GS31
Composite Sample				Composite 4				Composite 5				Composite 6			
Composite Sample Result				38				29				66			
Sample Depth (m)		HIL 'A' ^{AB}	HIL 'F' ^A	0.1-0.2	0.2-0.3	0.3-0.4	0.2-0.3	0.1-0.2	0.3-0.4	0.3-0.4	0.2-0.3	0.2-0.3	0.1-0.2	0.1-0.2	0.2-0.3
Date				18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	18/3/11	21/3/11	21/3/11
Sample Purpose				Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation
Sample collected by				PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Metals															
Arsenic	1	100	500	2.3	25	47	26	19	3.5	46	38	7.4	59	140	26

Sample Identification	PQL	Guideline		GS28	GS29	GS34	GS35	GS26	GS27	GS36	GS37	GS23	GS24	GS25	GS38
Composite Sample				Composite 7				Composite 8				Composite 9			
Composite Sample Result				63				34				54			
Sample Depth (m)		HIL 'A' ^{AB}	HIL 'F' ^A	0.2-0.3	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3	0.3-0.4	0.2-0.3	0.1-0.2	0.1-0.2	0.3-0.4	0.1-0.2	0.1-0.2
Date				21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	18/3/11	18/3/11	21/3/11	21/3/11
Sample Purpose				Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation
Sample collected by				PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC	PC
Metals															
Arsenic	1	100	500	32	150	4.4	15	16	51	24	43	56	49	9.6	83

Sample Identification	PQL	Guideline		GS39	GS40	GS48	GS49	GS41	GS42	GS46	GS47
Composite Sample				Composite 10				Composite 11			
Composite Sample Result				59				28			
Sample Depth (m)		HIL 'A' ^{AB}	HIL 'F' ^A	0.3-0.4	0.2-0.3	0.1-0.2	0.2-0.3	0.3-0.4	0.2-0.3	0.2-0.3	0.3-0.4
Date				21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11	21/3/11
Sample Purpose				Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation	Characterisation
Sample collected by				PC	PC	PC	PC	PC	PC	PC	PC
Metals											
Arsenic	1	100	500	46	13	130	2.7	23	12	42	34

All results are in units of mg/kg.

PQL = Practical Quantitation Limit.

^A NEPM 1999 HIL 'A' (Residential), HIL 'F' (Commercial/Industrial)

^B NSW EPA 1997 Table B Human health investigation thresholds - arsenic, lead, DDT and aldrin+ dieldrin only

Results shown in shading are in excess of the primary acceptance criteria: HIL F

Results shown in *italics* are in excess of the secondary acceptance criteria: HIL A

Results shown in **BOLD** are >250% of the secondary acceptance criteria: HIL A